the OIL AND GAS JOURNAL

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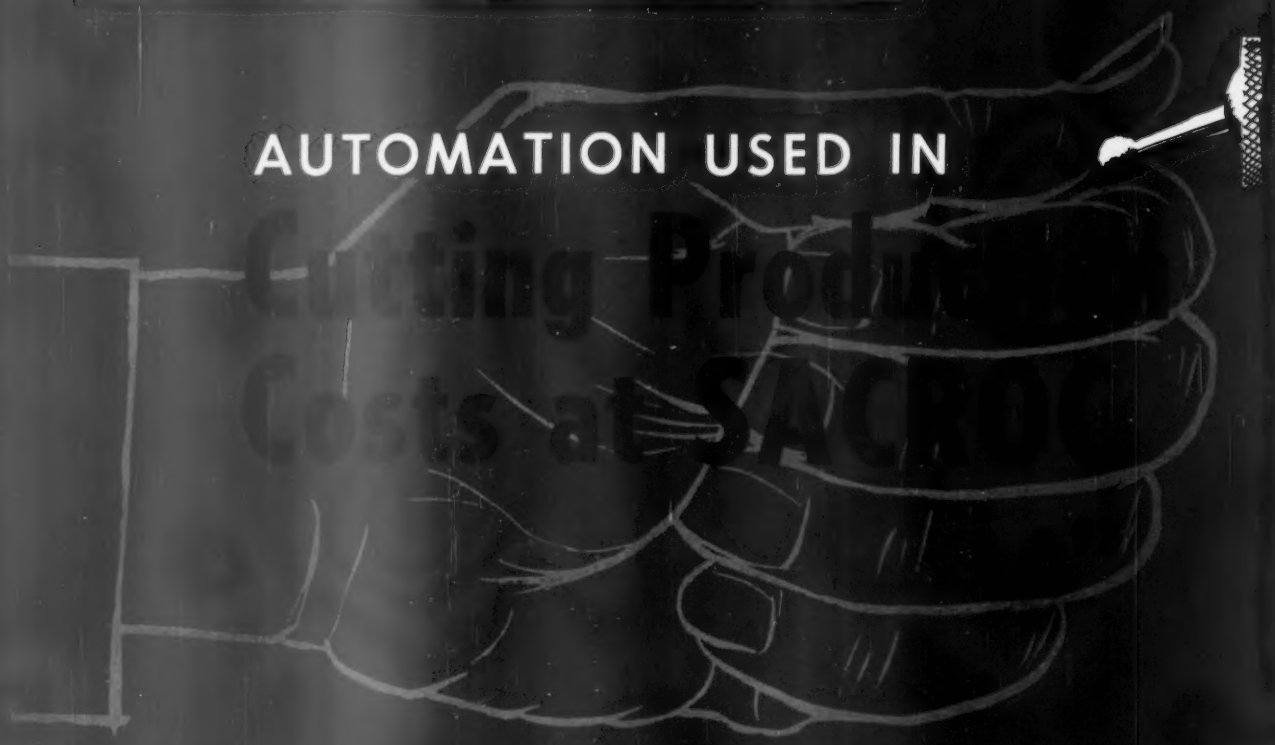

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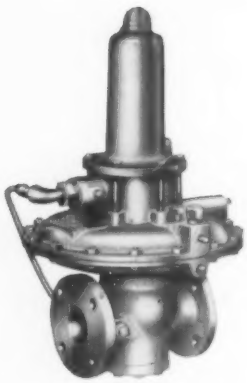
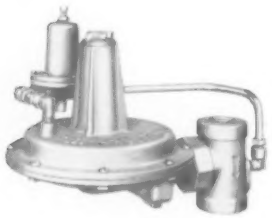
No. "120"
Low Pressure Regulator
Maximum Inlet Pressure—10 psi
Lbs. to inches
and lbs. to lbs. reduction
Bulletin 1044

NO. "080"
Instrument Regulator
Maximum Inlet Pressure—250 psi
Lbs. to lbs. reduction
Bulletin 1111



"No. 1001"
General Purpose Regulator
High Pressure Type—up to 250 psi inlet
Standard Type—up to 125 psi inlet
Lbs. to lbs. and lbs. to inches reduction
Bulletin 1059



No. "173"
Pilot Loaded Service Regulator
Maximum Inlet Pressure—100 psi
Lbs. to lbs. reduction
Bulletin 1113

No. "141"
High Pressure Field Regulator
Maximum Inlet Pressure—1500 psi
Lbs. to lbs. reduction
Bulletin 1024

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- BURNER CONTROL
- INSTRUMENTS

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OIL AND GAS JOURNAL
Vol. 59, No. 16

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TECHNOLOGY—OPERATION

Drilling-Production

Consolidation, Automation, Supervisory Control Cut SACROC Costs **92**

By Ed McGhee

One man controls all 50 wells in a big block of this giant unit in West Texas. New, sophisticated supervisory-control system automatically tests wells, records all data, and spots trouble. Tank-battery consolidation and central LACT round out impressive, modern operation.

Drilling-Cost Charts Mean Cheaper Wells **120**

By Vladimir Edelberg

Drillers have long wanted a quick, simple method to tell them how long they should run a bit and what bit weights and rotary speeds they should use. They can use new drilling-cost charts to get this information. The charts, combined with close examination of the dull bits, show cost and performance on a bit-by-bit basis with full allowance for local conditions.

Modular System Simplifies Oil-Field Automation **106**

By Hugo Shane

A new modular arrangement of automatic equipment has been developed. These units are self-contained and can be removed individually for repair or replacement, resulting in reduced maintenance costs. This concept has done much to make automation feasible for small leases.

Pipeline-Transportation

Supertanker Sanctuaries for the New Large Carriers **98**

By Commander Bernard Frankel

The tankers in the world fleet are growing bigger each year while the ports serving these supertankers are still in the World War T-2 class. Here's a plan for providing harbor facilities for these jumbo vessels.

Operation of Dual-Fuel Engine in Pipelining **128**

By Erik Kelgard

Fuel savings of up to 20% are possible through the proper control of variables affecting the operation of dual-fuel engines: combustion-air quantity, charging-air temperature and timing, and quantity of pilot oil.

Refining-Processing

Process Costimating—92 ..... **113**

Cost of refinery obsolescence.

Progress Report: American Oil at Texas City **116**

By H. C. Bozeman

The company's modernization program is forging rapidly ahead. It centers around three new units—the world's largest crude pipe still, a cat cracker and an alkylation unit—to replace six outmoded units.

WPRA Refining Panel: Plant Corrosion **118**

A panel of experts answers questions on the use of corrosion inhibitors and some of the newer onstream inspection techniques.

the OIL AND GAS JOURNAL Newsletter

Tulsa, Okla.
April 17, 1961

The octane race is over for at least 5 years:

Rating of premium gasoline is expected to show a slower growth—about a one octane number increase—over this period. This is only half of the expected increase.

A slightly higher increase is anticipated for regular, tending to reduce further the spread between the two grades.

This estimate of the outlook comes from a major TEL supplier attending the annual WPRA gathering in San Antonio.

Hydrocracking possibly will find a new application in the near future in upgrading condensate to high-octane gasoline.

Pilot-plant studies have shown a 58° condensate can be converted to a 116% (volume) yield of gasoline with a pool octane rating of 95.

Conventional catalytic reforming approach results in only about 50% gasoline, plus a large quantity of heavy gas oil.

At least one company is now seriously considering this application of hydrocracking.

Uses of hydrogen and possibilities of a cheap source for the material were a leading topic of technical conversation at WPRA.

Some refiners expect few applications of hydrocracking on the Gulf Coast in the near future.

The reason: It would destroy the favorable balance between gasoline and middle distillates (p. 76)*.

▼ ▼ ▼

Move of oil industry leaders to endorse a national fuels study won praise in San Antonio from Assistant Interior Secretary John M. Kelly.

He told refiners this change in oil attitude prompted President Kennedy to make his impartiality pledges.

Kelly also says the meetings on crude-oil import program set in Los Angeles May 4 and in Washington May 10-11 will keep the pledge of Interior Secretary Udall to take a new look at the situation.

The Washington beat:

A switch to domestic crude demand as the basis for crude-oil im-

*Refers to article in this issue giving more details. When no page is given, the item is a Newsletter exclusive.

port quotas is a strong possibility after the Los Angeles and Washington hearings.

This would not necessarily reduce the total crude import level, however, because the 9% figure now applied to product demand would probably be adjusted upward.

Producer groups have been urging the change, pointing out that increases in residual-fuel imports now broaden the demand base and thereby increase crude import quotas abnormally.

Upswing in U. S. oil equipment sales abroad seems likely.

The Export-Import Bank has been flooded with queries since the government policy change to permit assistance on medium-term credit—up to 5 years—on sales abroad.

A half dozen firm applications have already been made by equipment sellers, and at least one application is well along the processing route.

The bank is still refusing credit support for entire projects, such as a refinery, restricting its backing to equipment sales only. Good bet, however, is that government policy eventually will be broadened to include complete oil projects.

Oil men should be alert to tougher government stand against racial discrimination in employment by companies with U. S. contracts. Otherwise, they could have a contract cancelled and be banned from future bidding.

Military Petroleum Supply Agency is notifying all oil bidders of a new Clause 40 which spells out what a company must do to comply.

Brokers may charge oil firms as much as 10% for their service in barter plan being tested by the military in oil purchasing. Reason for the high fee, brokers say, is the complicated transaction involved.

Vice Admiral Burton Biggs may continue in his military oil post. He's due for retirement, but the assistant secretary for defense has asked the Navy to keep Biggs on active duty for another year.

▼ ▼ ▼

Rocky Mountain drillers had a big first quarter with 13% more completions than for the same period last year.

The tally: 1,039 completions including 390 wildcats. Figures last year were 921 completions and 332 wildcats.

Normal pattern is 21% of year's drilling work accomplished in first quarter. On this basis 4,948 completions are expected, making 1961 possibly the second best year in Rocky Mountain history.

Drilling is also picking up nationally.

Domestic completions last week totaled 954, gain of 17 over the previous week. Year's total now is 12,231 compared with 11,484 for the same period last year.

Transcontinental Gas is taking a new look at its proposed LPG line from Texas to North Carolina.

Reason: It's head-on competitor, Dixie Pipe Line, took in four more suppliers, completed its formal organization, and announced it will not consider combining its efforts with Transco.

Dixie now includes Humble, Shell, Sinclair, and Empire Gas (Cities Service) in addition to the original group of Warren, Union Texas Natural, Phillips, and Tuloma Gas Products. F. E. Neptune of Phillips was named president (p. 172).

Other pipelining trends worth noting:

More product lines apparently are in the cards as joint ventures of several companies...But prospects for any LPG line from Texas or the Rockies to California in near future aren't considered too good. Last survey on West Coast LPG needs indicated very little demand for importing LPG there.

Gas turbines are catching on fast. One pipeliner is preparing to install Pratt Whitney aircraft-type turbines on its line, like water pumps, in open air installations at intermediate points...Two full scale regenerating gas turbines in packaged units will be set up outdoors by another pipeline system...A third is testing a Solar industrial-type gas turbine and a GE helicopter-type turbine at the same station.

Interest is keen among pipeliners in CO_2 welding and internal sand blasting...Several competing CO_2 units are entering the field following Esso's demonstration...Trunkline will internally sand blast its entire 750-mile main line. The job is getting wide attention because the process challenges internal coating of pipe for gas lines.

▼ ▼ ▼

First mined underground LPG storage project in Minnesota is planned by Amerada and Signal, with Signal the operator.

Gulf also is mining the first LPG storage on the European continent. Company has several underground storage mines under construction at strategic points in Europe and plans to step up marketing of LPG sharply when the projects are completed and in use.

Prediction from a veteran LPG marketer: Underground storage is a comer in the industry for all products, even gasoline.

Some strange developments: Use of scrambling devices for the telephone and radio facilities of oil companies is growing. Portable scramblers are regularly used by Shell for drillers, lease buyers, and others dealing with secret data. They are proving important time savers in transmitting confidential information safely... There's a report on the West Coast that Honolulu Oil may withdraw its offer to sell. Some company officers reportedly are unhappy with the deal.

Market Memo

April 17, 1961

Marketers are keeping close watch on refinery runs as the key to future prices—and runs just won't stay down much.

Last week they averaged 7,899,000 bbl. daily. That's 44,000 bbl. daily higher than the week before. It's also 174,000 bbl. daily above the 7,725,000 bbl. daily average set by The Journal as a desirable level for the second quarter.

Strange quirk: Although runs were up, output last week of four major products was 237,000 bbl. daily less than week before. Much of the material must have been held as unfinished stocks.

Products markets generally are quiet with the Mid-Continent the strongest.

Gasoline is apparently firm at 12.5 cents with one-fourth cent discount possible only for volume spot business. Demand for No. 2 surprisingly is holding up due to the windy, chilly weather still hanging on in many parts of the midlands.

Gasoline price weak spots persist in metropolitan areas around Kansas City, Chicago, and the Twin Cities. Heavy fuel prices also dipped in Chicago when American cut tank wagon on No. 5 by a half cent and No. 6 by one-fourth of a cent.

Gulf Coast refiners are trying to hold gasoline prices at posted lows of 10.75 cents for 92-octane and 11.75 for 100-octane. Real test of the market, however, is lacking due to scarcity of buyers. They are counting on a demand pickup soon to firm up the tone of prices.

No. 6, the darling of the Gulf market for months, now is weak at $2.20. At least five cargoes still are available and attracting no interest.

Mississippi River markets are unusually quiet. Mid-river points quote gasoline at the Gulf low except Arkansas City where it takes one-half cent off the Gulf low to get the business.

On the East Coast, a general weakening of distillate prices is reflected in deeper discounts, foreshadowing the possible second general price reduction of the spring. Discounting increased from 0.3 of a cent a gallon to 0.5 in New England and the range in the Philadelphia area was 0.25 to 0.5 of a cent. Gasoline was weak in parts of Maine, the Carolinas, upstate New York and Long Island.

Around the marketing beat: Gulf's price hike for West Texas sour hasn't picked up much open support yet...Census Bureau reports service-station sales in March rose to $1.4 million from $1.2 million in February and from $1.38 million in March last year...New trademark is being introduced in the LPG trade for Gulf Warrengas, designed to give recognition to the Gulf-Warren marriage...Utah's retailers will police new law limiting price signs at stations.

Good Wells Make Good News

Outstanding Results from Recent Dowell Fracturing Treatments

April 17, 1961

Dowell uses both new and time-proven material and techniques to help operators improve wells. Here are four recent examples:

- Taylor County, West Texas (New Oil Well) This development well was to be completed in the Shep Gray Sand Pool at 5321 feet. Operator wanted to get maximum initial production. Dowell notched the formation with Abrasijet* abrasive jetting service, then fractured. A two-jet gun was rotated at 1¼ rpm during jetting to notch casing. Following a 10-gallon spearhead of Freflo* surfactant, Petrojel* fracturing service was used. 11,760 gallons gelled crude, modified with fluid loss control agent, were used to carry 3400 pounds 20-40 mesh sand and 700 pounds 8-12 mesh walnut shells. Well tested 168 bopd in a field where the average test is about 70 bopd.

- Crook County, Wyoming (Old Oil Well) This well, completed in 1959, had originally produced 168 bopd, but production had declined to 50 bopd. Pay was the Dakota at about 6000 feet. Dowell fractured using Petrojel. A 200-gallon spearhead of Mud Acid was followed by 20,000 gallons gelled lease crude with fluid loss additive and 20,000 pounds sand. Injection was 22 bpm at 2300 psi. 40 days after treatment, production was 960 bopd with no water.

- Ouachita County, Arkansas (Old Oil Well) Production from this well in the Blossom sand, from 2110 to 2117 feet, had declined to 3 bopd. Dowell treated using Riverfrac*. 40,000 gallons salt water with demulsifier added, 20,000 pounds 20-40 mesh sand and 20,000 pounds 10-20 mesh sand were injected down 2½-inch tubing at 14 bpm and 1900 psi. After treatment, production was 33 bopd.

- Hemphill County, Texas Panhandle (New Gas Well) An interval in the upper Morrow was perforated from 11,930 to 11,950 feet. It gave no show on natural swab test. Well was fractured down 2½-inch tubing twice using Waterfrac. For the first treatment, 20,000 gallons gelled water and 17,750 pounds sand were injected at 10.5 bpm. After load returned, well tested 8500 mcfd with five barrels distillate per million. The second treatment consisted of 2000 gallons regular acid, 50,000 gallons gelled water and 50,000 pounds sand injected at 14.5 bpm. Twenty-four hour shut-in pressure was 5500 psi and well tested 9000 mcfd with 20 barrels distillate per million -- 180 barrels of distillate per day!

Ask your Dowell representative for suggestions about how to get better production from your wells. Dowell services and products are offered from more than 150 offices and stations in the United States, Canada, Venezuela, Argentina, Germany, France and the Sahara area. Dowell, Tulsa 1, Oklahoma.

*DOWELL TRADEMARK

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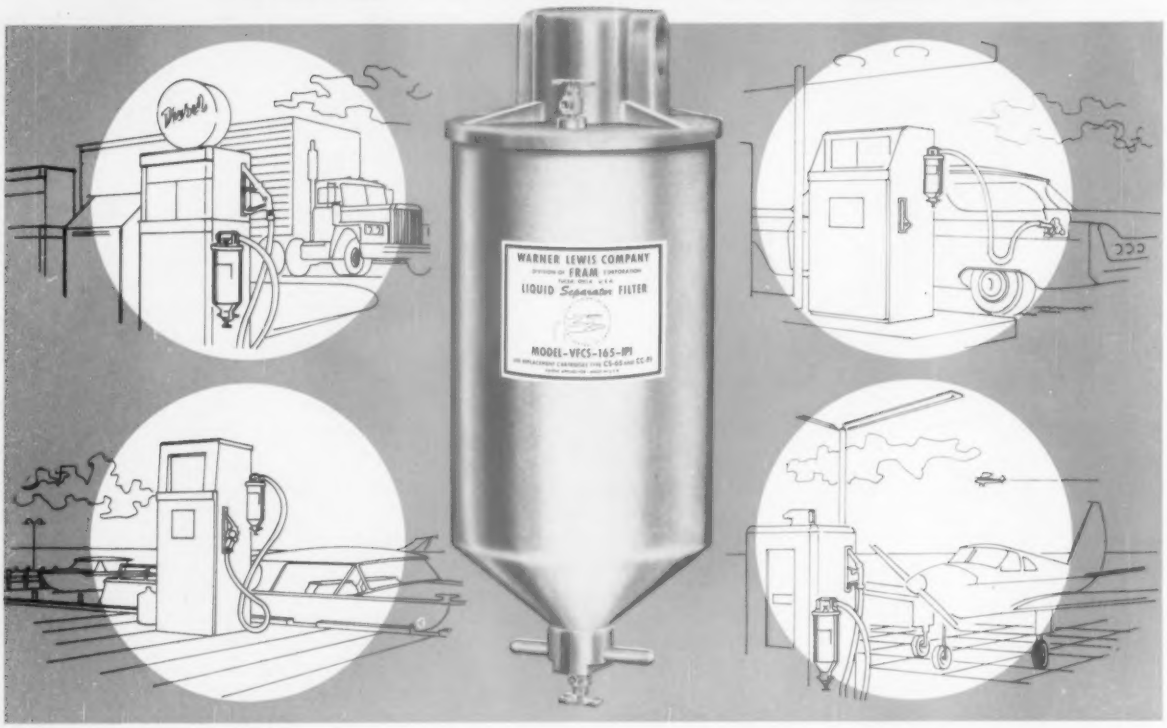

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How it helps cut compensation costs

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DM/DC SQUEEZE PACKER...

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a full-opening hydraulic mechanical packer equipped with a built-in circulating valve. The HM Packer features simplicity of operation ... tool is set by merely turning tubing to the right and slacking off weight. Following the job, picking up on tubing will release the packer for removal or re-setting.

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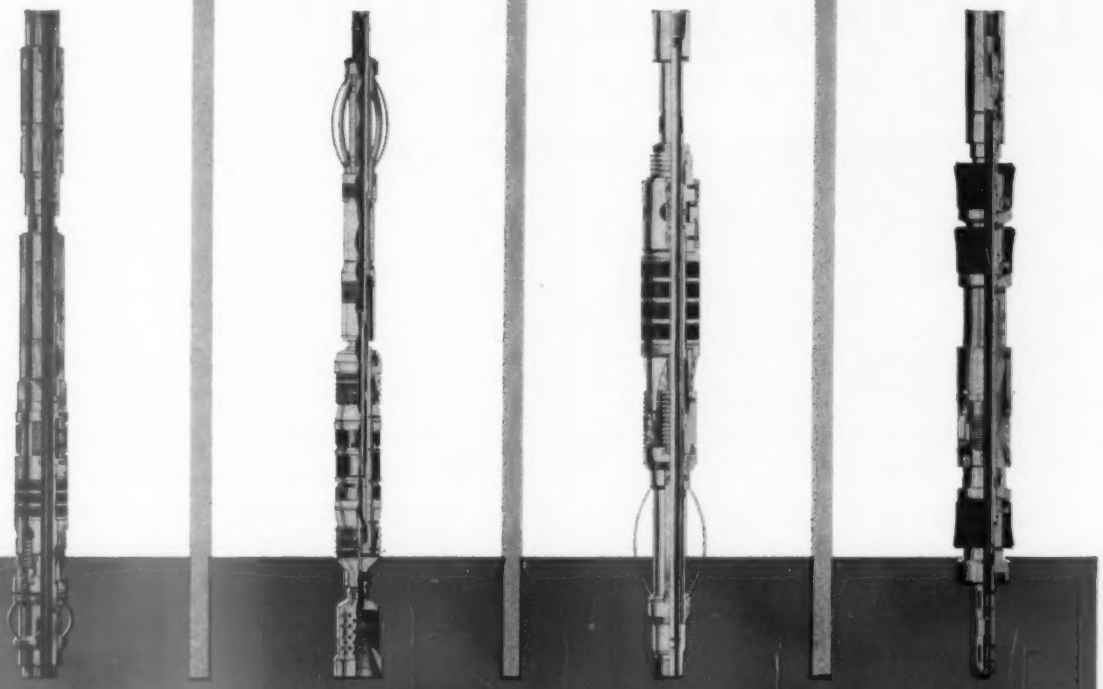

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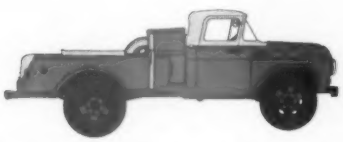

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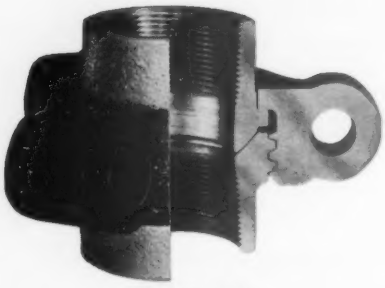
City_____ State_____

the key to streamlined, economical production hook-ups

When laying field lines, setting tank batteries, separators, heaters, treaters, etc.—when assembling headers and manifolds, WECO Unions are your best, most dependable, leakproof connections. The ball and cone seat seals leakproof with just a few turns of the wing nut. The precision-cut pipe threads on the subs fit perfectly, run up fast and leakproof without galling or damage.

When valves, meters, regulators and other control equipment are installed with WECO Unions, they can be removed with the minimum of time and effort. In fact, any production unit can be removed easily from the line for repairs or maintenance when you Standardize with WECO Unions in your production hook-ups.

Next time and every time, specify WECO Unions, and you will soon have your standardization program complete, saving you time and money for years ahead. Talk to your WECO Representative or your Supply Store for WECO UNIONS.

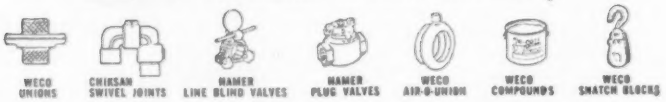


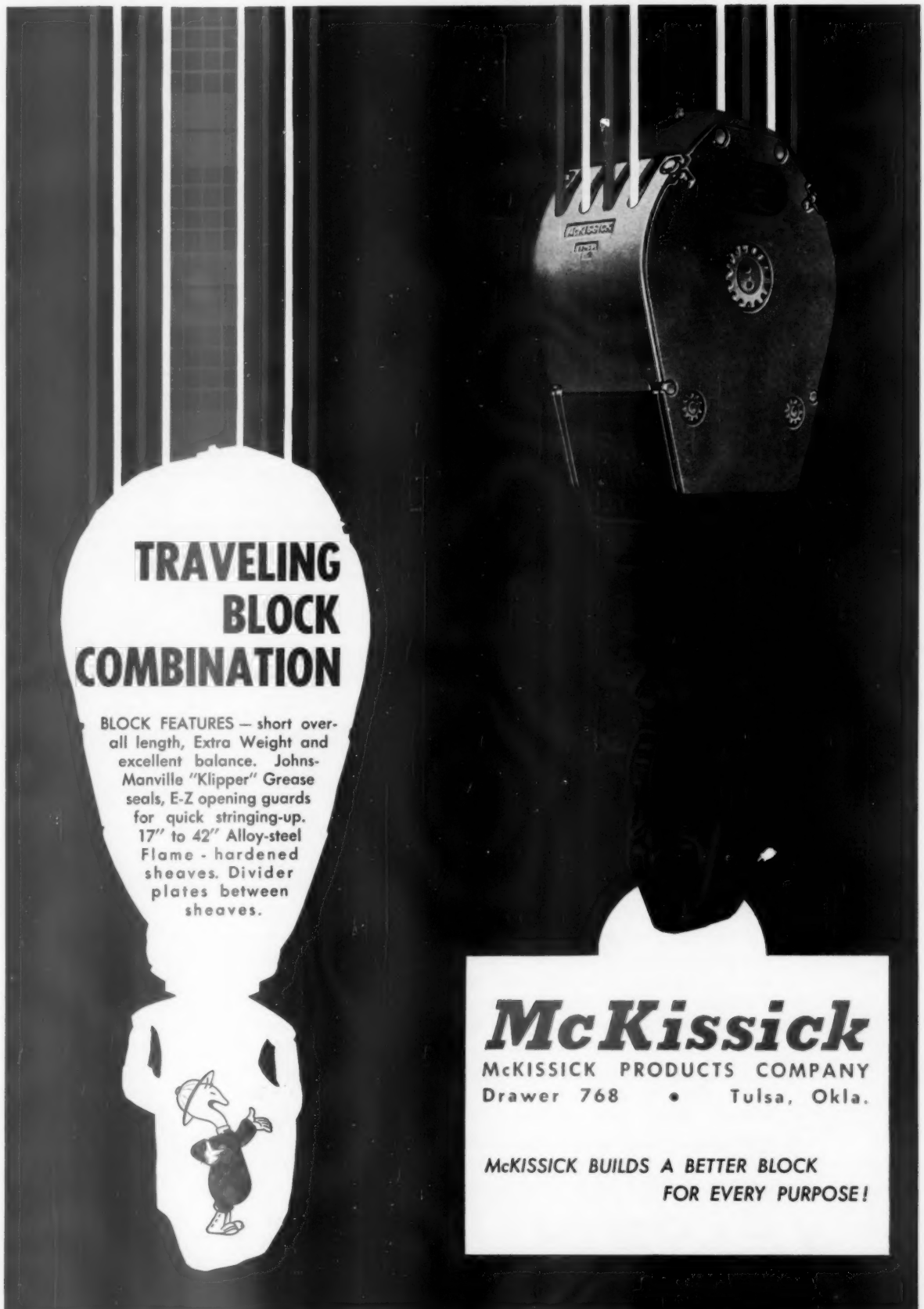
WECO Fig. 100
1000 psi test
Sizes: 2" thru 8"

This popular 3 lug "Bar Nut" union is ideal for production installations. Completely interchangeable.

WELL EQUIPMENT MFG. CORP.
HOUSTON, TEXAS
Division of CHIKSAN COMPANY *a subsidiary of* FOOD MACHINERY AND CHEMICAL CORPORATION

U-2-61





TRAVELING BLOCK COMBINATION

BLOCK FEATURES — short over-all length, Extra Weight and excellent balance. Johns-Manville "Klipper" Grease seals, E-Z opening guards for quick stringing-up. 17" to 42" Alloy-steel Flame - hardened sheaves. Divider plates between sheaves.

McKissick

McKISSICK PRODUCTS COMPANY
Drawer 768 • Tulsa, Okla.

McKISSICK BUILDS A BETTER BLOCK FOR EVERY PURPOSE!

How to buy a ball valve!

Check these features!

	FLO • BALL	VALVE A	VALVE B	VALVE C	VALVE D	VALVE E
1. TOP ENTRY	√			√		
2. IN-LINE MAINTENANCE	√			√	√	
3. TOP AND BOTTOM GUIDED BALL	√					
4. DOUBLE SEATS	√	√	√	√	√	√
5. FLANGES INTEGRAL WITH BODY	√	√		√		
6. ONE-PIECE BALL AND STEM	√					
7. BLOCK AND BLEED	√					
8. COMPETITIVELY PRICED	√	√	√		√	√

Only FLO·BALL has all 8

In addition to these outstanding features, the **FLO•BALL** valve, with all teflon seats and seals, offers all of these advantages which make it far superior to other types of valves: fast ¼ turn, minimum pressure drop, leakproof shut-off, visible on-off indication, no backlash, and the lowest torque of any valve. The **FLO•BALL** can never stick or freeze, and it lasts longer, with less maintenance, than any other valve made.

HYDROMATICS offers the most complete line of industrial ball valves, including 1" through 14" flanged, 150#, 300# and 600#, all built to ASA dimensions. Also available: ⅛"—2" screwed end valves to 3000#.

HYDROMATICS is the world's most experienced ball valve manufacturer, having built ball valves to 10,000 psi and 14". See your local distributor for details and prices, or write to:

Hydromatics, Inc.

BLOOMFIELD, N. J. • PILGRIM 8-7000 • TWX = BLOOMFIELD, N. J. 120

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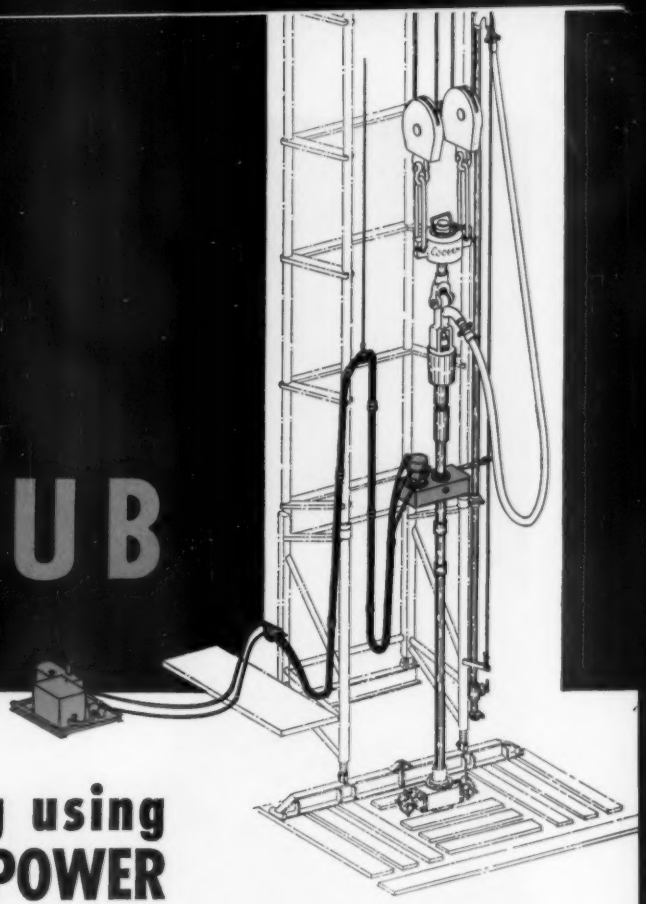
FLO-BALL

COOPER'S NEW
HYDRA-SUB



rotates the drill string using AVAILABLE HYDRAULIC POWER

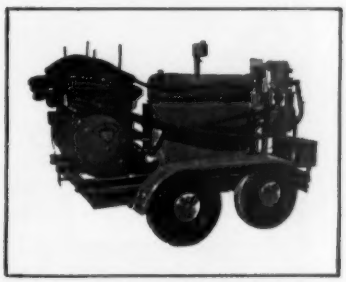
This new tool is designed for drilling and workovers. It is positioned on the drill string just under the swivel and on top of the drill pipe. As the hydraulic power is delivered through hoses the Hydra-Sub is free to move up and down in the derrick. This gives complete flexibility for fishing tool, workover or drilling operations. Rotation with the drill string is prevented by torque arms which travel on stabilizing lines in the derrick. Any standard swivel may be used.

HYDRA-SUB SAVES MORE THAN $2,000.00 OVER CONVENTIONAL ROTARY METHOD

A comparison of costs shows that the model 6030 rated at 30 H.P. which is suitable for most workovers and shallow or slim hole drilling, costs much less and has many advantages over older methods of rotating the drill string. The 6030 operates from most hydraulic systems on derricks or power tool systems.

NOW YOU DON'T NEED Rotary table, kelly, rotary drive sprockets and clutches — drive chains — chain guards or substructures to hold table.

YOU GET Fluid drive eliminating shock loads on drill string — reduces hazards and prolongs life of drill pipe. Accurate predetermined, torque control which protects threads, prevents twist-offs, makes possible continuous coring — has the flexibility for any job. Easily transferred from rig to rig.



Cooper trailer mounted Hydraulic Power Source and Model 6060 Hydra-Sub complete — ready for the road.

COOPER HYDRA SUB
COOPER POWER SOURCE

NOW THREE SIZES

Each is available with hydraulic ratings of 30 H.P., 60 H.P. and 90 H.P.

Power sources available with connections for other power tools. Skid or trailer mounted. Trailer complete with electric brakes and highway safety equipment. Powered by choice gasoline, LPG or diesel engines.

KEEP WATCHING FOR ALL THAT'S NEW FROM

FRED E. Cooper, Inc.

P. O. BOX 1890 · TULSA, OKLA.

Branches: Houston, Odessa, Olney

ORIGINATOR OF MOBILE WINCH UNITS

Bearing at left has 1.75" bore, while tandem bearing in main illustration has 17.0" bore. *Yet both are standard, cataloged items.*

Over 400 Cataloged Thrust Bearings
to fit your every need . . .

When you need a thrust bearing, no matter how special, Rollway is ready with the know-how and the precision machinery to design and produce it for you.

Our engineers will gladly consult with you regarding any standard or special-purpose types you need. No cost. No obligation. Rollway Bearing Co., Inc., Syracuse. N. Y.

Complete line of Radial and Thrust Cylindrical Roller Bearings

Select from 7
ROLLWAY
Standard Types

designed, tested and ready for production with load capacities to 4,800,000 pounds.

Ask for Catalog PT-659.

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BEARINGS

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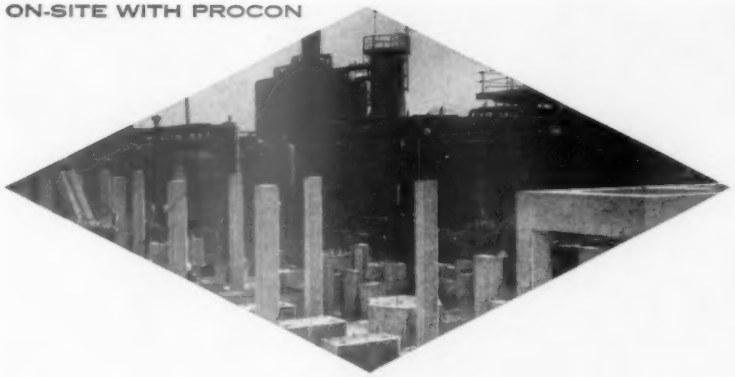
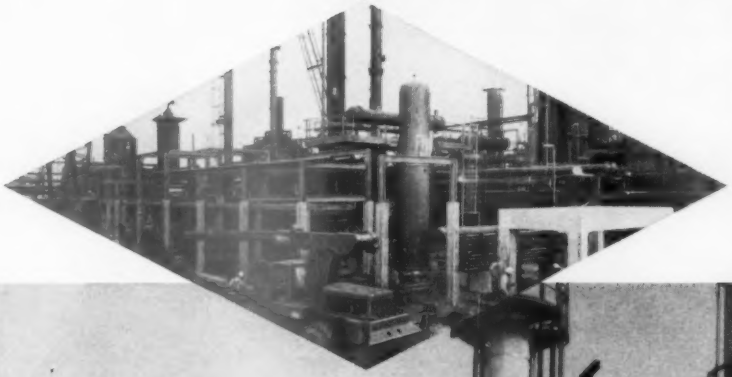
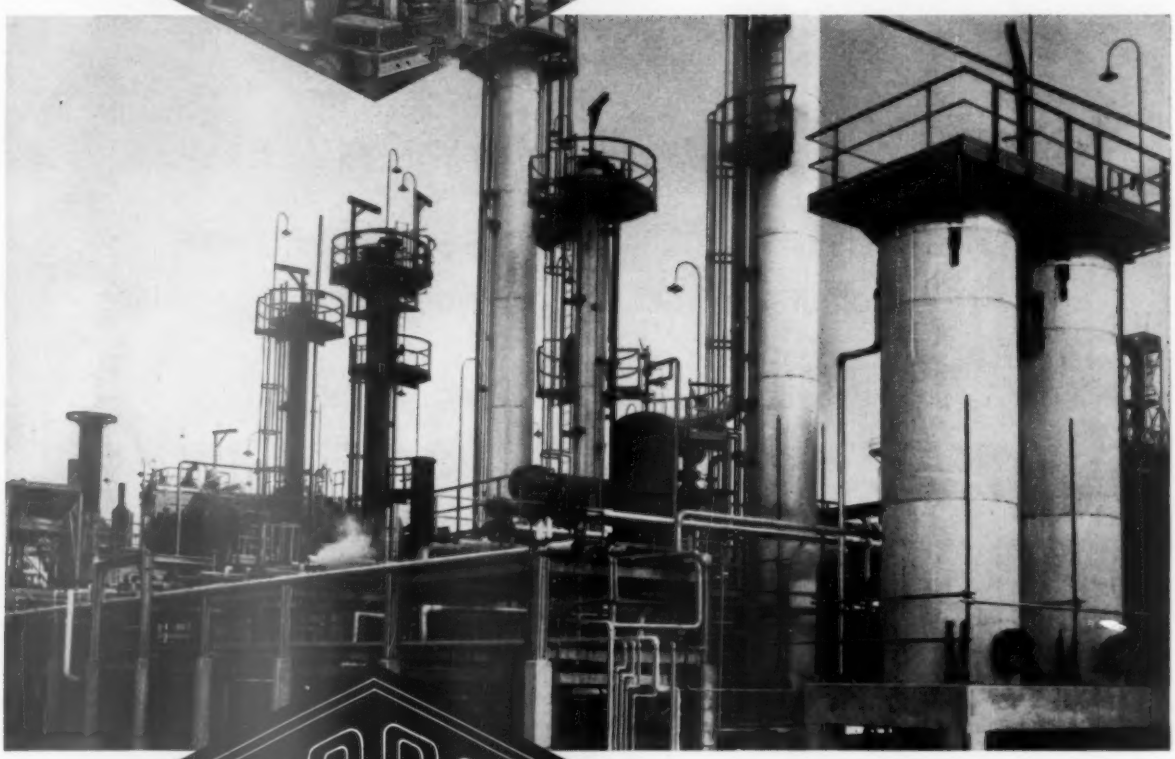
ON-SITE WITH PROCON







Procon-built Hydeal unit on-stream in 95 days!

Building a complicated process unit from the ground up requires the skillful coordination of a multitude of design, engineering, procurement and construction details.

It takes plenty of work, but most of all it takes time. Procon needed just 95 days from groundbreaking to on-stream acceptance of this Hydeal™ unit built for Signal Oil & Gas Company, in Houston, Texas. This highly efficient Hydeal unit produces 1,000 barrels-per-day of high quality benzene from a toluene charge. Signal markets the benzene direct to users in the Southwest.

New plant construction, expansion or modernization, whatever the requirement, you can trust the entire job . . . safely to PROCON.

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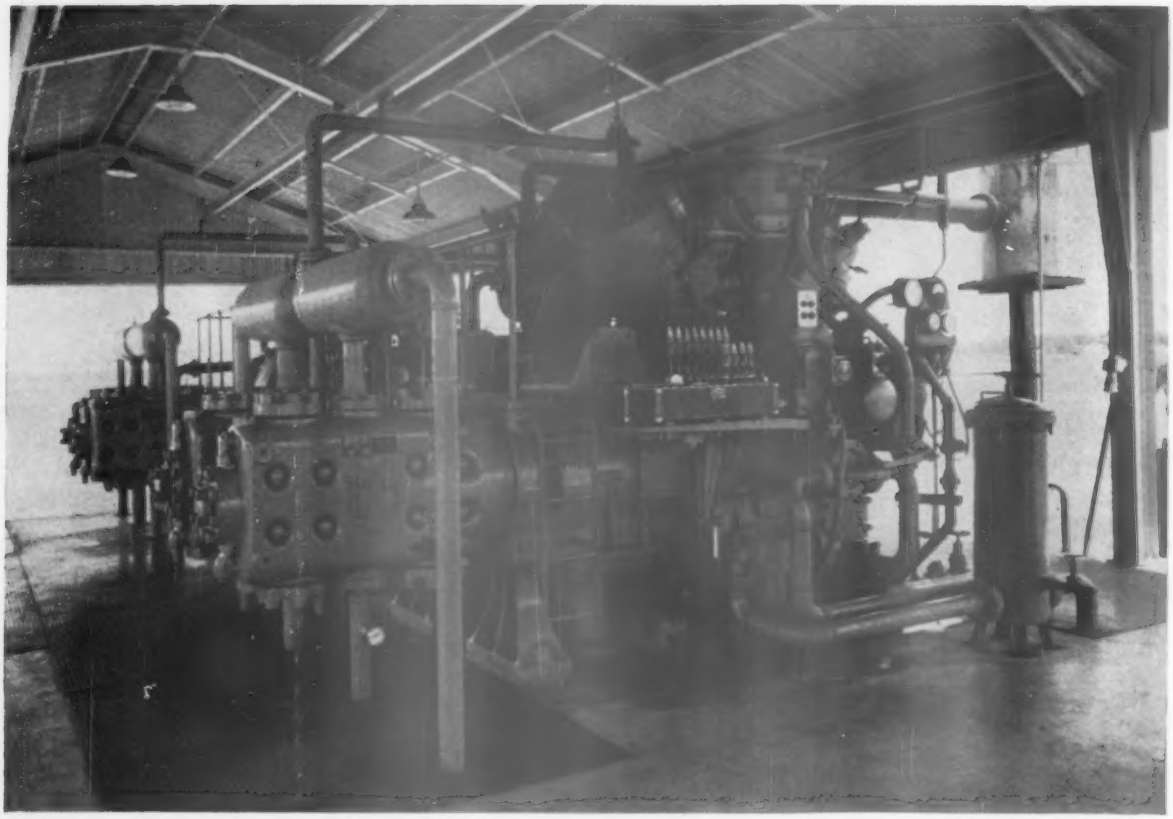


MORE PUMPING TIME, LESS DOWNTIME...

Ambitrol coolants protect against freezing and corrosion

DOUBLE PROTECTION against industrial engine downtime is now available through two new Dow products—Ambitrol* FL and Ambitrol CN coolants. In addition to affording complete freeze protection, Ambitrol offers two methods for combating the widespread problems of local water hardness and corrosiveness.

Ambitrol FL industrial cooling system fluid completely fills the system, requiring no dilution—problems with local water conditions are eliminated. This product is designed to provide freeze protection for industrial cooling systems down to –40° F., with protection against overheating up to a temperature of 240° F.

Since inhibitor depletion can still occur in any cooling system due to extremely severe operating conditions, leakage, etc., Dow provides a further protection with the Dow *Cooling System Maintenance Program.* This is a product analysis service in which periodic samples of the Ambitrol in use are sent to the Dow Industrial Coolants Laboratory. Reports on these samples are returned to the user and contain full information for servicing to maintain both freeze protection and inhibitor effectiveness.

Ambitrol CN is a freeze-depressant concentrate which is blended with local water at the site. Its inhibitor system offers superior protection against damage from corrosion even in the many varieties of water throughout the United States. As with Ambitrol FL, users of Ambitrol CN can participate in the benefits offered by the Dow *Cooling System Maintenance Program.*

Ebullient cooling has solved many of the problems of bigger and more powerful engines, new alloys, and closer tolerances that impose exacting demands for uniform engine temperature control. Ebullient cooling, one system designed to control temperature within a narrow range, is gaining in interest and use. The system calls for chemical compounds radically different from those used in conventional cooling systems. From its continuing research, The Dow Chemical Company developed Dowtherm® 209 coolant to meet these new demands for uniform engine temperature control. Today, Dowtherm 209 is used by many stationary engines having ebullient cooling systems. Its properties offer freeze protection, ideal operating temperatures, and extreme corrosion resistance.

For more information on Ambitrol, Dowtherm 209, or any petroleum industry problem involving chemicals, write directly to THE DOW CHEMICAL COMPANY at Midland, Michigan.

*TRADEMARK

THE DOW CHEMICAL COMPANY DOW Midland, Michigan

with faith in the oil industry's future . . .
GARDNER-DENVER MAKES THE NEWS

6-cylinder plunger pumps for mud service

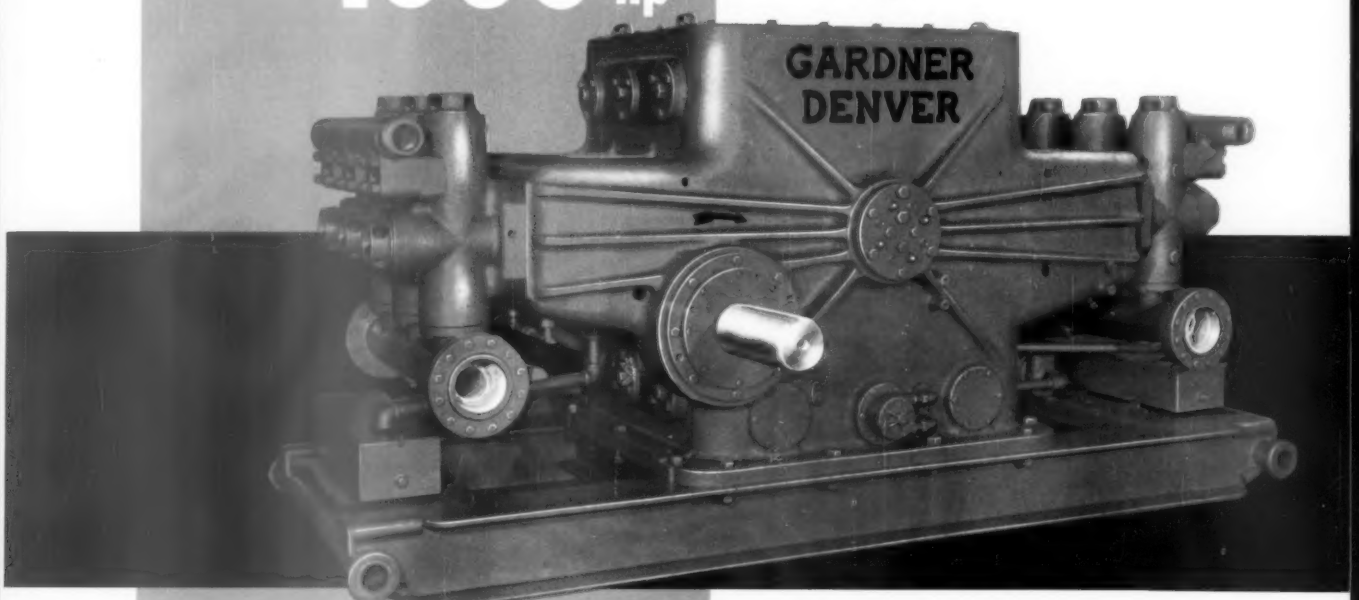
TWO MODELS

PO-7 700 hp

PV-9 1000 hp

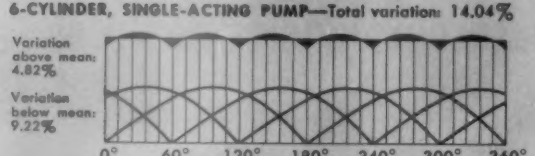
OUTSTANDING FEATURES

- Smooth discharge flow because of multiple cylinders and Scotch yoke design which give true harmonic motion.
- Individual and interchangeable forged steel fluid cylinders.
- Scotch yoke design eliminates crossheads, pistons, connecting rods and fluid cylinder head.
- Light weight per horsepower.
- Force-feed lubrication to all power end parts by two lube pumps.



DIAGRAMS OF DISCHARGE FLOW

6-CYLINDER, SINGLE-ACTING PUMP—Total variation: 14.04%

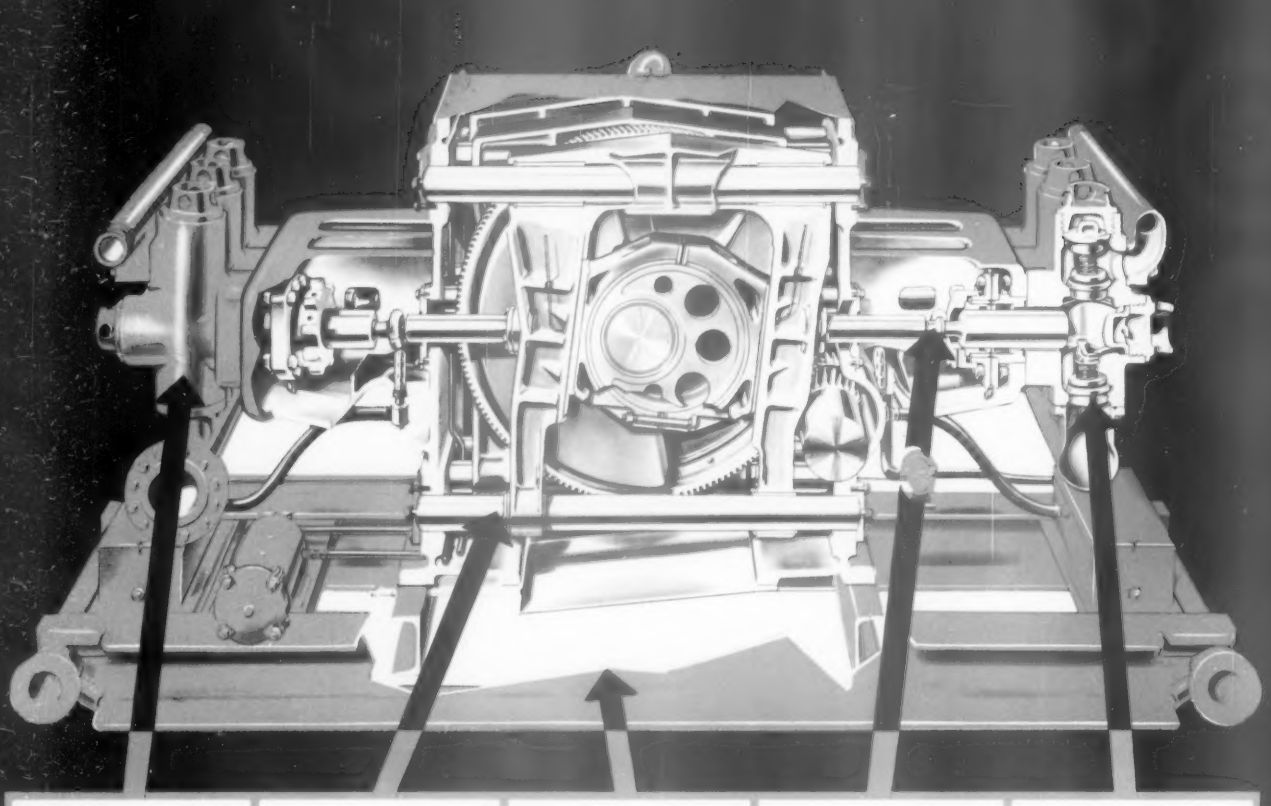


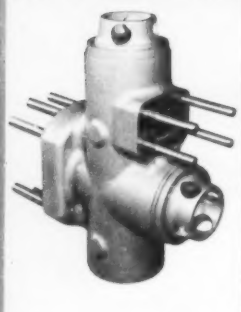
DUPLEX DOUBLE-ACTING PUMP—Total variation: 45.6%

it's what's inside that counts

GARDNER-DENVER

QUINCY, ILLINOIS





Individual, heavy forged and heat-treated alloy steel cylinders withstand high pressures. Cylinders may be replaced individually. Threaded valve covers permit quick inspection or replacement.

Scotch yoke and follower ribbed to provide adequate strength, without excess weight. Replaceable bronze bearings on all wearing surfaces.

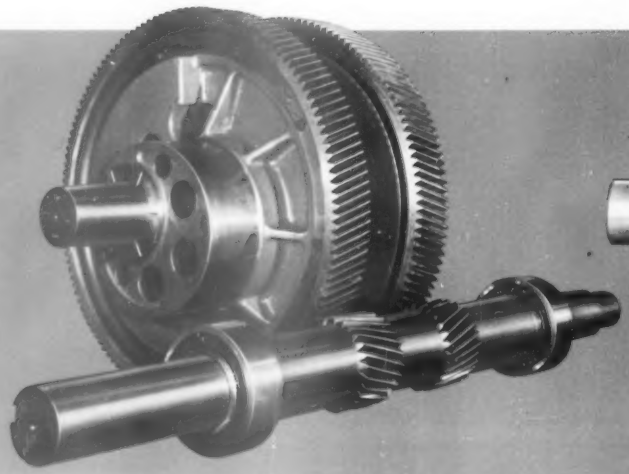
Lubricating system includes two gear-type oil pumps, driven from main gears and connected in parallel for maximum safety. Pumps are mounted outside crankcase for easy checking or servicing.

Gardner-Denver plungers are hard-surfaced to resist corrosion and extend wear life. Plungers disconnect quickly from push rods, and are readily removed through suction valve opening.

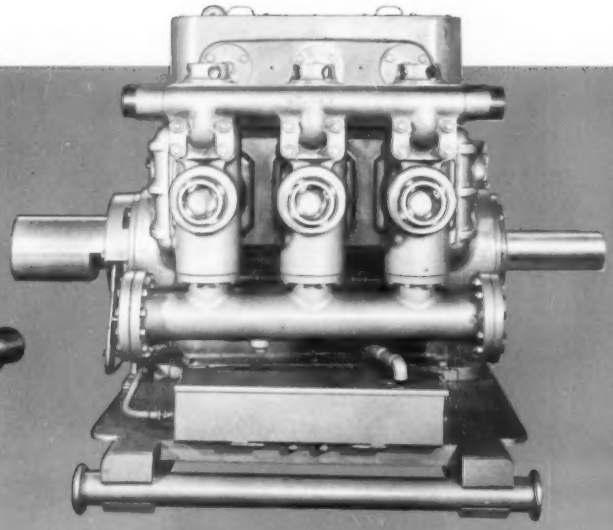
Gardner-Denver valves and seats for suction and discharge are forged of alloy steel, hardened on seating and guide surfaces. Valve inserts are of improved design. Upper valve guides are renewable.

Gardner-Denver engineering gives you new high-pressure pump performance with these outstanding features...

- **Smooth discharge flow** because of true harmonic motion from Scotch yoke design and multiple cylinders. Design tested over five years by Gardner-Denver.
- **No pulsation dampener** required for smooth operation.
- **Individual, interchangeable,** *forged steel fluid cylinders.*
- **Smaller, lighter fluid end parts** for quick, easy maintenance.
- **Cylinders are designed so that plunger can be removed through suction valve opening.**
- **Scotch yoke design eliminates** crosshead, pistons, connecting rods and fluid cylinder head.
- **Light weight per horsepower.** Weight of 700 hp pump, skid-mounted: 28,000 lb.
- **Accessible plungers and packing easily changed.**
- **Force-feed lubrication to all power end parts by two lube pumps.**
- **High volumetric efficiency (95-97%) with use of charging pump.**
- **Long plunger life.**
- **Forged alloy steel, crown-shaved gears.**



Eccentric counterweights are cast integrally. Crown-shaved gears are cut on heat-treated alloy steel forgings and bolted to eccentric. Bearings are bronze on hardened steel shaft. The double extended jackshaft, carried on roller bearings, permits driving from either side.



Valve chambers are integral with individual die-forged and heat-treated alloy steel cylinders. Suction and discharge manifolds operate off either side of pump.

You get versatility in a compact package

The rugged construction of Gardner-Denver's PO and PV pumps centers on Scotch yoke design. Scotch yoke provides compact crankcase—eliminates useless weight, eases moving problems. Yet, you get the horsepower and pressures you need for jet bit drilling, for drilling to extreme depths and for well servicing. The versatility of these pumps permits you to change from one type of service to another simply by disengaging plungers on one end. Operate pump at full power on six cylinders for continuous mud service. Or use either bank of three cylinders for high-pressure, intermittent service for well servicing, well killing, cementing, fracturing, acidizing and workover services—or for emergencies during drilling operations.

When operated with six cylinders for continuous service, pump ratings are:

PO-7—700 hp input at 130 rpm; maximum pressure, 4493 psi, or maximum displacement, 668 gpm; plunger load, 43,161 lb.

PV-9—1000 hp input at 125 rpm; maximum pressure, 5000 psi, or maximum displacement, 825 gpm; plunger load, 50,000 lb.

When operated with three cylinders for intermittent service, pump ratings are:

PO-7—700 hp input at 130 rpm; maximum pressure, 8986 psi, or maximum displacement, 334 gpm; plunger load, 86,322 lb.

PV-9—1000 hp input at 125 rpm; maximum pressure, 10,000 psi, or maximum displacement, 412 gpm; plunger load, 100,000 lb.

For complete specifications, write for Bulletin PO-V.

EQUIPMENT TODAY FOR THE CHALLENGE OF TOMORROW

GARDNER - DENVER

GARDNER-DENVER Since 1859

Gardner-Denver Company, Quincy, Ill.—Offices in principal U.S., Canadian and Mexican cities.
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LITHO IN U S A

"Give Georgette the usual Braniff treatment
(but please, no champagne)"

Shame on Georgette's owner. She should know that Braniff knows her poodle would prefer a delicious steak bone to champagne.

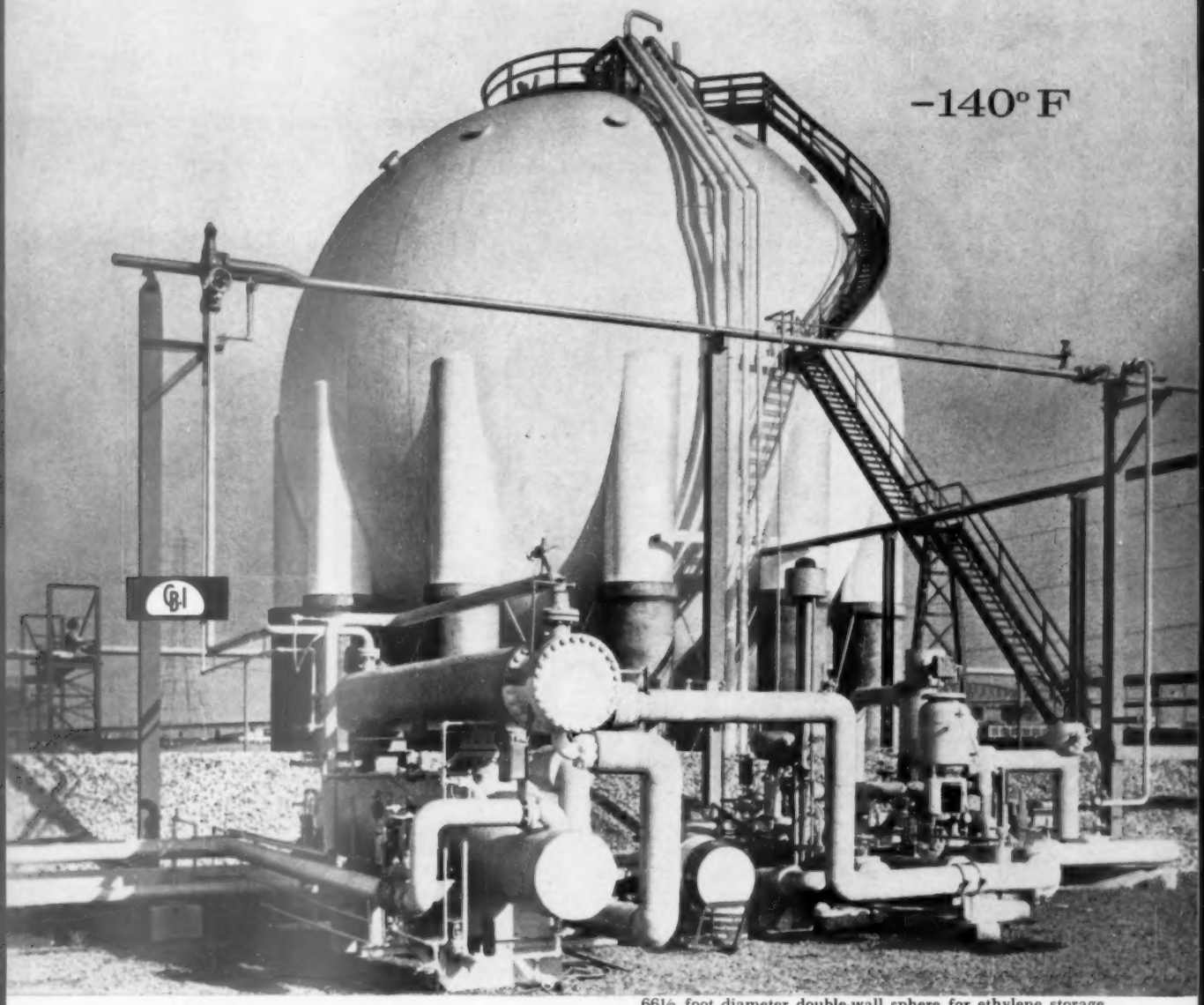
Making people (or poodles) feel at home aloft is our specialty. That's why we serve the finest meals in the U. S. skies, complete with elegant Silver Service. That's also why our hostesses and ground personnel are a little more thoughtful, a little friendlier.

And if you like to feel at home, and get home on time, you'll find we keep our on-time record consistently one of the best in the field. (Often, the best!)

Try us. Fly to one of the 50 U.S. cities we serve. Or speed on luxurious El Dorado Super Jets to 10 Latin American countries. (The oil and gas industries are booming down there. So is everything else! We recommend Latin America for business and pleasure.) Bring the family; and on most flights, bring the family pooch if you'd care to. (Don't worry. We won't serve champagne where it isn't likely to be appreciated.) Come along very soon. You'll see why we like to say: You belong on Braniff.

BRANIFF
International
AIRWAYS

NOTABLE FIRSTS



66½ foot diameter double-wall sphere for ethylene storage

FOR LIQUID ETHYLENE

The 20,000 bbl. sphere in which liquid ethylene is stored at −140°F at the Bayway Refinery of Esso Standard, Division of Humble Oil & Refining Company, Linden, New Jersey, has the distinction of being the largest double-wall sphere as well as the largest above-ground storage unit for ethylene in the U.S.

CB&I's extensive experience in cryogenic storage was called upon, through Stone & Webster Engineering Corporation, to design, fabricate and erect the sphere. This is another example of how CB&I readily provides the most suitable cryogenic storage unit when new liquid gas storage requirements arise.

CB&I has built more than 75% of all of the field-erected cryogenic storage vessels in the world. May we tell you how this experience can provide the most advantageous liquid gas storage for you?

CB&I

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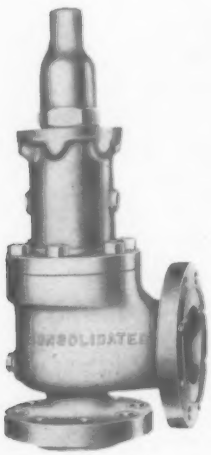
332 South Michigan Ave., Chicago 4, Ill.
Offices and Subsidiaries Throughout the World

CB-613

top

CONSOLIDATED SAFETY RELIEF VALVES have a special "O" Ring Seat Seal that stops leakage completely



Consolidated Safety Relief Valves are available in both Standard and Balanced Bellows design for extreme corrosive applications.

tightness

The Seal is a resilient ring set in the valve disc. It maintains no-leak tightness by contact with a specially curved seating surface on the valve nozzle, yet does not carry the seat load imposed by the valve spring.

Tightness is maintained at operating pressures far closer to set pressure than with metal-to-metal seats alone. Tight closure is as efficient after "simmer" as on normal blowdown. Piping strains are absorbed far better by the resilient seal than all-metal seating. If the tough seal is ruined by entrained abrasives, replacement is easy. Seals are available in materials that resist corrosive fluids. Maintenance costs are greatly reduced.

Standard Consolidated Safety Relief Valves have an eductor tube that removes pressure from the closed bonnet. Only the spring controls valve action. You get guaranteed capacity ratings and highest dependability—absolute protection for personnel and equipment. Additionally, there is the economy of converting the Standard valve to the Balanced Bellows type in your own shop. Get complete details. Write for Bulletin 1940.

MANNING MAXWELL & MOORE INC. M&M TRADE MARK

CONSOLIDATED SAFETY RELIEF VALVES

A product of

MANNING, MAXWELL & MOORE, INC.

Valve Division • Tulsa, Oklahoma

Canada: Manning, Maxwell & Moore of Canada, Ltd., Galt, Ontario
Latin America: Export Division, Chrysler Building, New York, N. Y.
Europe: Manning, Maxwell & Moore, S. A., Fribourg, Switzerland

Layne Vertical Turbine Pumps are designed, engineered and manufactured by Layne in Memphis, Tennessee and nowhere else. Because pumping needs vary, there is a Layne pump for every pumping requirement—from 30 to 100,000 G.P.M. in sizes from 4 to 42 inches. Layne Pumps include Deep Well and Short Coupled (oil or water lubricated), Propeller, Mixed Flow, Regular and "In-Line" Submersible. For additional information write for bulletins 200-oil lubricated or 201-water lubricated.

The Layne Gravel Wall Well is an example of Layne experience, engineering and research. This gravel packing and 134 shutter screen employment affords larger screen openings, reduced friction, reduced draw down and pumping head. It increases specific capacity and makes for more effective retention of native sands. For additional information write for bulletin 900.

From top to bottom, you can depend on Layne for the most complete water service in the industry. This complete service provides undivided responsibility for the delivery of water . . . of the quality and in the quantity required. Over 75 years of *growing* service gives the skill and technical know-how which makes Layne First in the field of water. For additional information write for bulletin 10.

LAYNE OFFERS COMPLETE WATER SERVICE:

Initial Surveys • explorations • recommendations • site selection • foundation and soil-sampling • well drilling • well casing and screen • pump design, manufacture and installation • construction of water systems • maintenance and service • chemical treatment of water wells • water treatment—all backed by Layne Research.

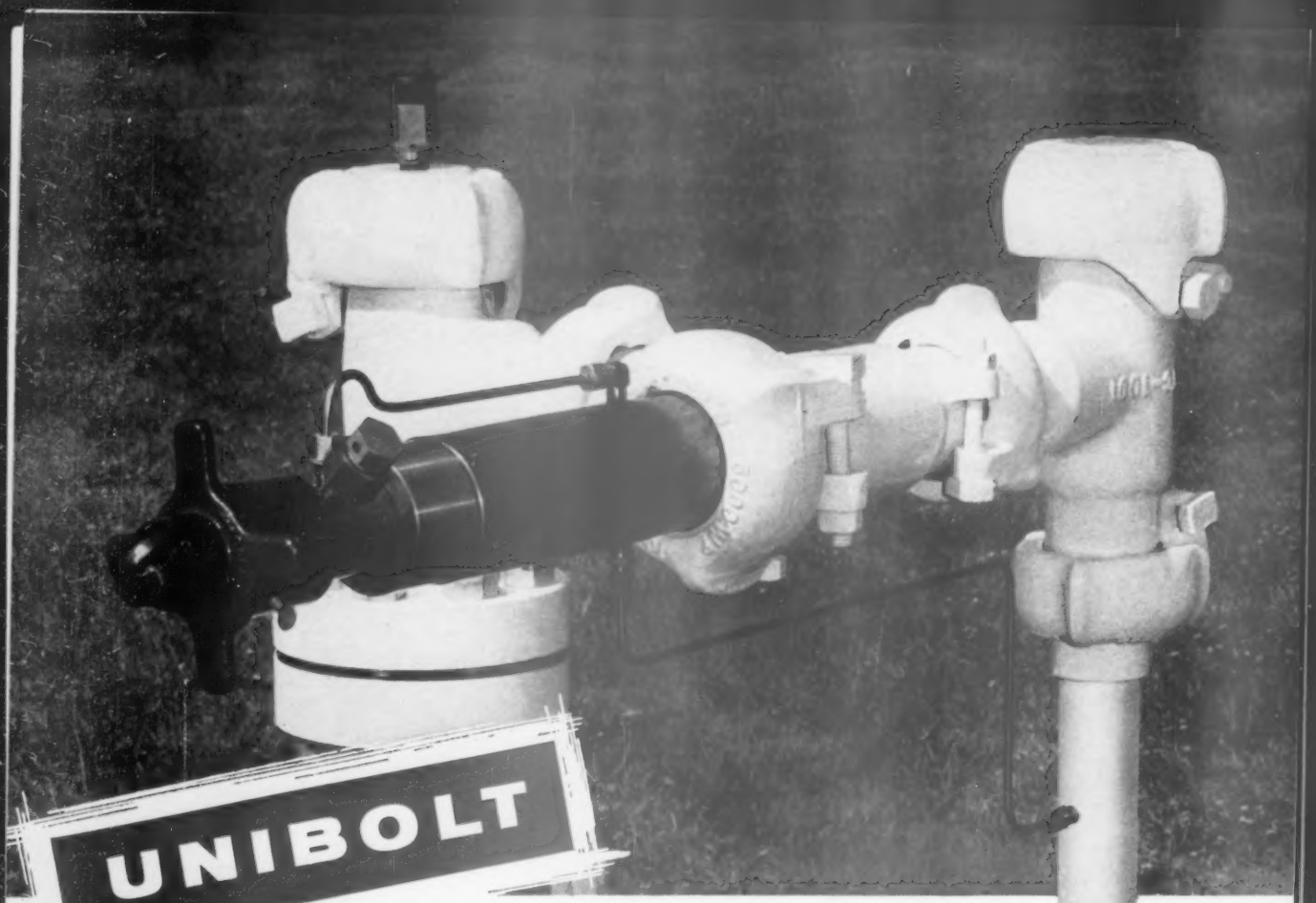
Layne services do not replace, but coordinate with the services of consulting, plant and city engineers.

LAYNE & BOWLER, INC., MEMPHIS

General Offices and Factory, Memphis 8, Tenn.

LAYNE ASSOCIATE COMPANIES THROUGHOUT THE WORLD

SALES REPRESENTATIVES IN MAJOR CITIES



Pressurematic Valves

Provide dependable, low-cost insurance against all flow-line hazards

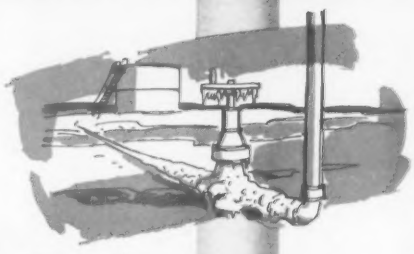
Here is a valve that does the work of two valves yet costs little, if any, more than a good high pressure valve. It is both a high-low safety and a Christmas tree wing valve.

The UNIBOLT PRESSUREMATIC VALVE combines all of the time-tested and proven features of the Unibolt Adjustable Wing Valve with a novel automatic actuating accessory. The valve closes instantly when a predetermined pressure balance across the seat is disturbed. The actuating mechanism consists of a small piston which is exposed to well pressure and a larger piston which is exposed to flowline pressure. A broken flowline or open valve, for example, in the production system, would lower the flowline pressure and thus instantly close the valve. Once closed, the valve may be easily opened and set manually for automatic operation. The downstream or low pressure line may be tapped at any remote point and thus embrace any desired portion of a gathering and treating system. Offshore and other remotely controlled wells could be shut in automatically in case of fire, ship collision, etc. The unique design lends itself to many such applications.

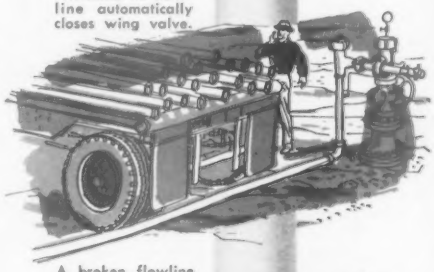
Send for literature or contact your nearest Unibolt sales representative.

YOU CAN CONVERT YOUR UNIBOLT ADJUSTABLE WING VALVE TO "PRESSUREMATIC."

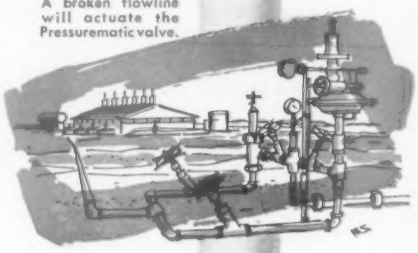
The regular UNIBOLT Adjustable Wing Valve can be readily converted to "Pressurematic" by replacing the stem/bonnet assembly with the Pressurematic unit.



Freezing or hydrate formation in flowline automatically closes wing valve.



A broken flowline will actuate the Pressurematic valve.



Failure of a pressure regulator on pipe line gathering manifold would shut in the well.

UNIBOLT

THORNHILL CRAVER CO.

P. O. Box 1184, Houston, Texas

THOMAS A.

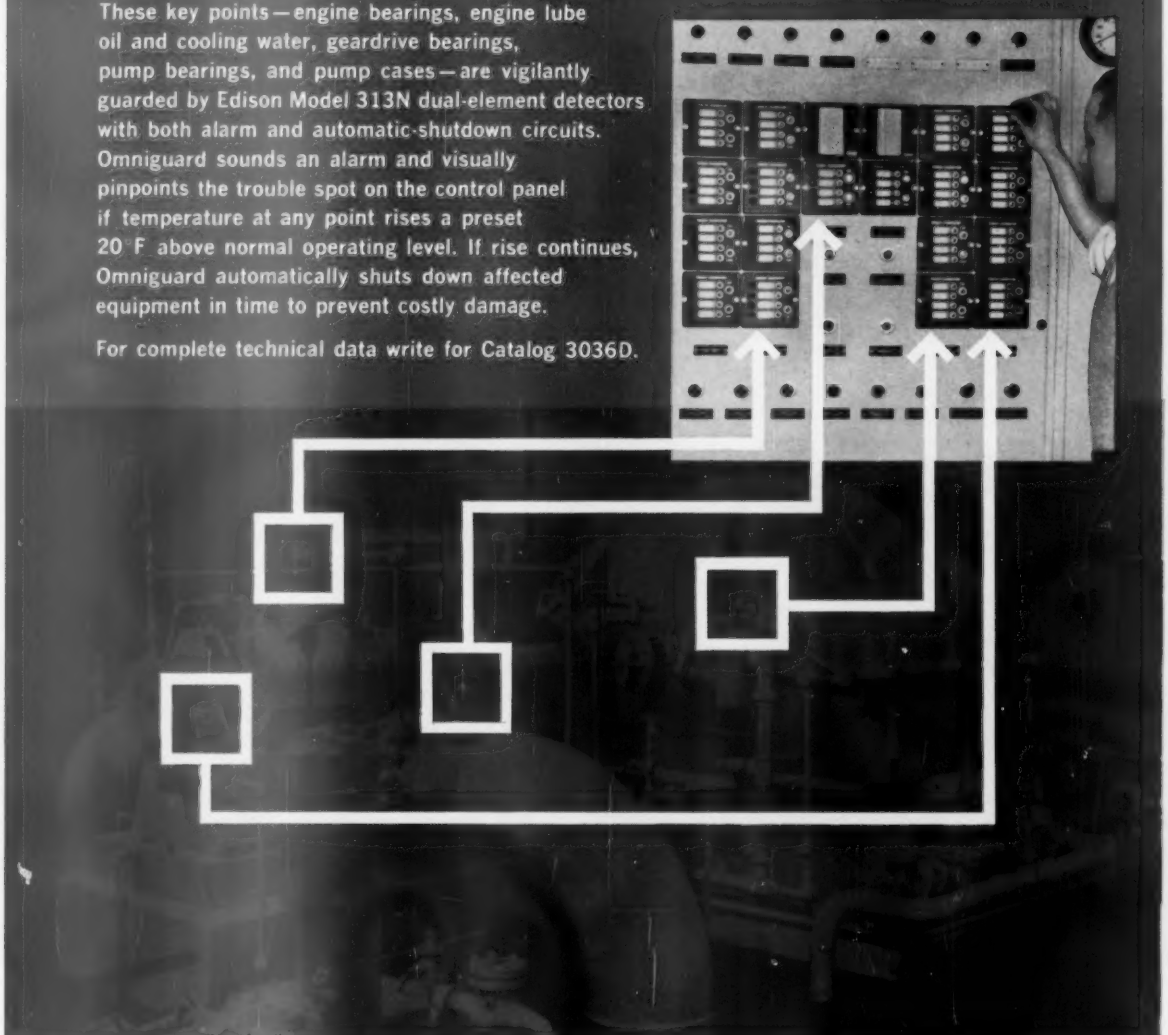
EDISON OMNIGUARD SYSTEM

SAFEGUARDS VITAL EQUIPMENT FOR TRANS MOUNTAIN OIL PIPE LINE CO.

Transfer of a quarter-million barrels of crude oil is the tough daily quota set for the four pumps and 1500-horsepower engines at the Trans Mountain station, Edson, Canada. To ensure constant, uninterrupted delivery at this heavy flow rate, Trans Mountain engineers specified an Edison Omniguard system to stand watch over critical temperatures in all vital parts of their pumping equipment.

These key points—engine bearings, engine lube oil and cooling water, geardrive bearings, pump bearings, and pump cases—are vigilantly guarded by Edison Model 313N dual-element detectors with both alarm and automatic-shutdown circuits. Omniguard sounds an alarm and visually pinpoints the trouble spot on the control panel if temperature at any point rises a preset 20° F above normal operating level. If rise continues, Omniguard automatically shuts down affected equipment in time to prevent costly damage.

For complete technical data write for Catalog 3036D.

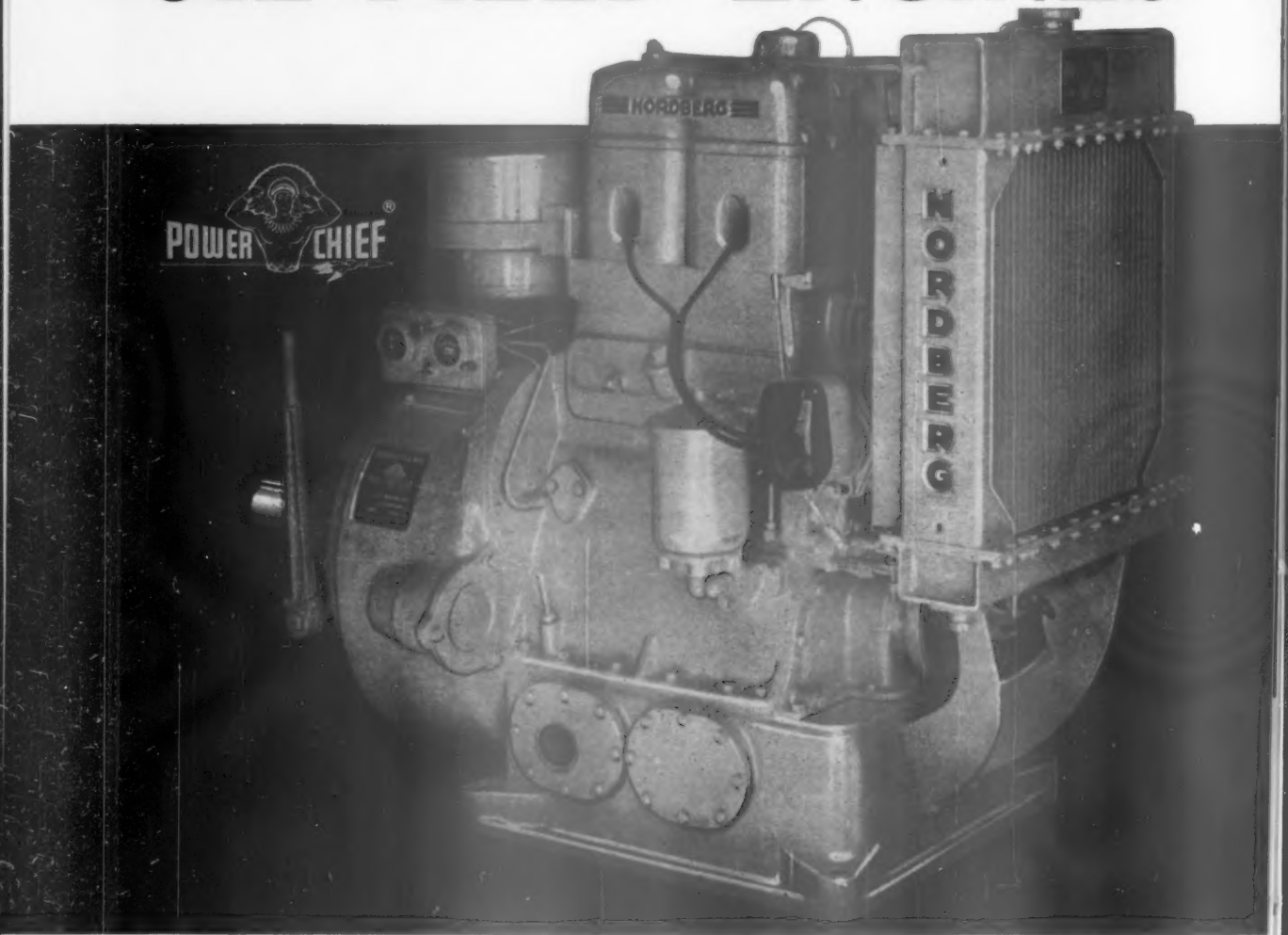


Thomas A. Edison Industries
INSTRUMENT DIVISION
42 LAKESIDE AVENUE, WEST ORANGE, N. J.

ECKRAM EDISON

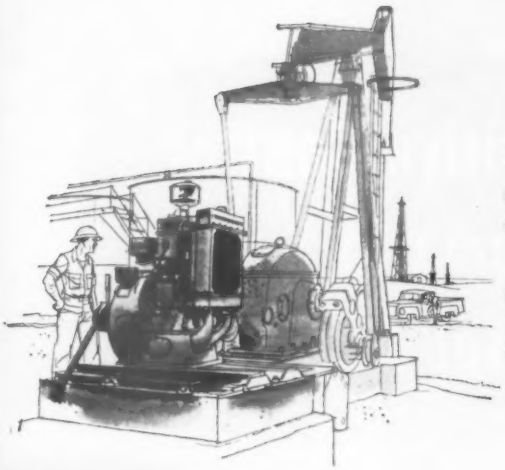
PERFORMANCE-PROVED

POWER CHIEF® OIL FIELD ENGINES



Throughout the oil fields, Power Chief Diesel and Gas Engines are consistently achieving records for reliability and low maintenance costs. Built in 1, 2 and 3-cylinder sizes, all having 4½" bore and 5¼" stroke, these heavy duty, medium speed units develop up to 54 hp max. Here are some of their important features:

Smooth, steady operation—heavy flywheel eliminates surging during pumping stroke . . . More safety features—including enclosed flywheel, enclosed clutch, enclosed fan, magneto impulse coupling eliminates starting kickback . . . Full pressure lubrication throughout engine . . . Lube oil heat exchanger eliminates sludging of oil in crankcase . . . Can be easily converted from gas to diesel operation . . . No extras to buy, engine comes complete with clutch and safety shutdown controls . . . Easy to service.



for production pumping and water flooding...

It will pay you to consider that actual Power Chief case histories show over 43,000 hours of continuous pumping operation—*with original rings, pistons, liners, bearings and crankshaft still in place!*

Here, then, is positive proof that Power Chief oil field engines, in sizes to 54 hp. really deliver the kind of rugged, day-in, day-out power you need for dependable production pumping and water flooding service at the very lowest maintenance cost.

for rig lighting...

Power Chief Diesel Electric Generator Sets are turning night into day for 24-hour drilling operations . . . as more and more drillers discover that these sturdy units can stand the gaff of continuous service, night after night, without constant attention and maintenance.

Built in 1, 2 and 3-cylinder sizes, Power Chief Diesels develop from 10 to 45 hp, 5 to 30 kw, in all standard AC and DC voltages . . . and all available with special vibration-proof mounting for rig installation.

for micro-wave communications...

Nordberg Power Chief Diesel generating units are being used to provide low cost, dependable power for both stand-by and main power source in micro-wave pipe line radio communication systems. And remember . . . these compact, rugged units are backed by the same reputation for dependability as the larger Nordberg engines used across the nation for low cost pipe line pumping service.

NORDBERG MANUFACTURING COMPANY
Milwaukee 1, Wisconsin

ATLANTA • CLEVELAND • DALLAS • DULUTH • HOUSTON • KANSAS CITY • MINNEAPOLIS
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FOR DETAILS

Nordberg Mfg. Co., Milwaukee 1, Wisconsin
Send literature on Power Chief Oil Field Engines to:

Name_____ Title_____

Company_____

Address_____

City_____ Zone_____ State_____

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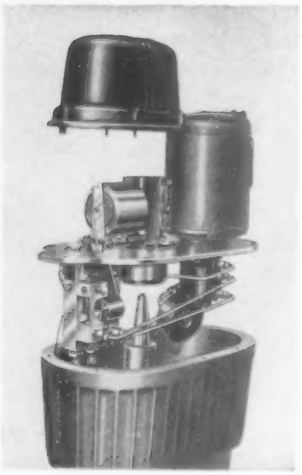
PC1 60-R

COMPLETELY SELF-CONTAINED ELECTRO-HYDRAULIC ACTUATOR FOR

Fisher Type 350 control valve at a products pumping station in the Southwest.

Positive Control Where Pneumatic Supply Is Not Available

● High performance without use of electronic amplification ● No close fitting parts ● Simple nozzle-flapper combination controls hydraulic pressure ● Maximum stem thrust of 5,000 pounds ● Can be used with many styles of valve bodies in sizes from ½" to 16" with strokes from ½" to 3". *Write for Fisher Bulletin E-350A for complete details.* Fisher Governor Company, Marshalltown, Iowa. Plants in Woodstock, Ont., Rochester, England. Butterfly Valve Division: Continental Equipment Co., Coraopolis, Pa.



TYPE 350

Exploded view showing arrangement of components on mounting plate. Every part except hydraulic cylinder and piston may be removed as one unit. For periodic maintenance entire unit may be replaced with stand-by assembly in minutes.

PERFORMANCE DATA—TYPE 350
(2,000 lb. thrust unit)*

Stroking Speed—0.37 in/sec
Stalled Stem Thrust—2,000 pounds
Linearity—Better than 2% of full travel
Resolution Sensitivity—Better than 0.05%

Load Sensitivity (Percent of total travel per 100 lbs. load)

Input Signal	Internal Resistance of Actuator	Load Sensitivity
1 to 5 ma DC	2,200 ohm	1.0%
1 to 5 ma DC	12,000 ohm	0.38%
4 to 20 ma DC	260 ohm	0.92%
10 to 50 ma DC	380 ohm	0.3%

Frequency Response (Complete frequency response curves available)

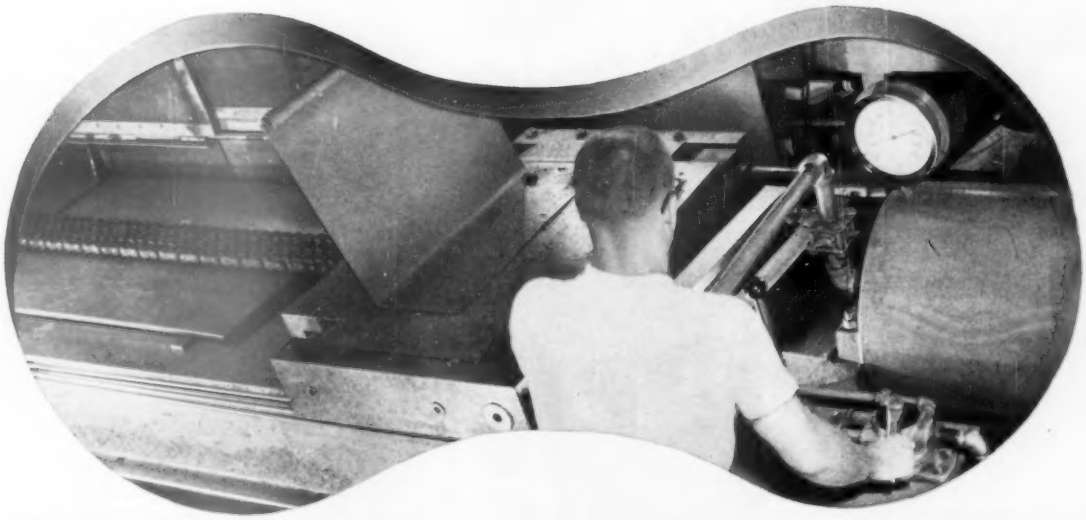
Stem Travel	Cps at 90° Phase Shift
½"	1.9
1⅛"	1.5
3"	.8

**Also available with 5,000 lb. thrust unit.*

If it flows through pipe anywhere in the world ...chances are it's controlled by.....

FISHER® Controls SINCE 1880

Another
of the invisible extras that
insure MORE ON-BOTTOM TIME
with LINK-BELT FR®
roller chain

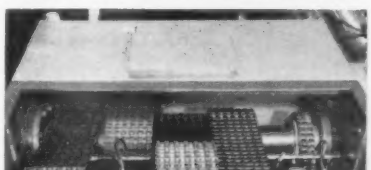


prestressing of multiple-strand chain guarantees

uniform load distribution

Unless each strand carries its fair share of the load, roller chain may fail under the tremendous tensions of drilling service. That's why Link-Belt's prestressing is so vital. Prestressing seats and cold-works the chain joint parts . . . assures equal load distribution across the chain, reduced elongation in service.

Prestressing is just one of many *invisible extras* that contribute to the greater strength and endurance of Link-Belt roller chain. Others include precise heat-treat control, Fatigue Resistant FR* processing of sidebars, shot-peening and burnishing of rollers.



IDECO M-2500 3-SPEED TRANSMISSION incorporates Link-Belt FR roller chain.

These features—plus top precision and rigorous inspection in every step of manufacture—assure you of chain that can easily withstand the smashing impacts and tortuous stresses met in day-to-day drilling.

For engineering assistance in applying FR roller chain, write Link-Belt Company, Indianapolis 6, Indiana. Ask any leading supply store for our Catalog 2980 containing full information on roller chain and other oil field equipment.

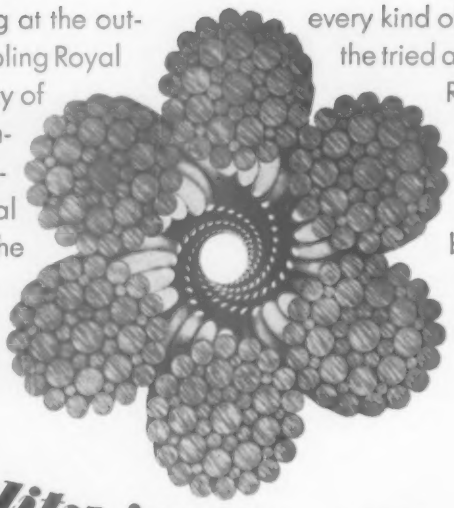
*U. S. Patent No. 2,517,497

LINK-BELT COMPANY: Indianapolis 6, Houston 1, Dallas 26, Odessa, Tex., New Orleans 16, Shreveport, La., Los Angeles 22 (Montebello), Scarboro (Toronto 13); Export Office, New York 7. Distributors in All Fields. 15,781

LINK-BELT

ROLLER CHAINS AND SPROCKETS

Here are two ways of looking at the outside and *inside* quality of Roebling Royal Blue Wire Rope—the uniformity of wires and strands. Their symmetry would be relatively insignificant, however, without Royal Blue's *extra* high strength. It's the combination that is the source of real wire rope savings. For long, economical service on every kind of job, there is no substitute for the tried and proven quality of Roebling Royal Blue. It pays off for *you*. Learn more about Royal Blue from your wire rope distributor, or write now for free booklet to Roebling's Wire Rope Division, Trenton 2, N.J.



ROEBLING

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John A. Roebling's Sons Division
The Colorado Fuel and Iron Corporation.

Quality inside and outside

We put a lot of work into it—
You get a lot of work out of it

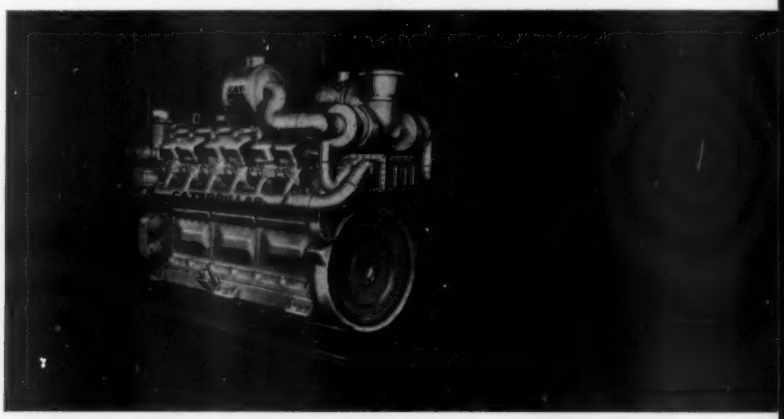
engine power
BY CATERPILLAR

CATERPILLAR ANNOUNCES TWO NEW POWERFUL DIESEL ENGINES FOR OILFIELD USE

These new dependable Cat Diesels are designed to give you big power anywhere you need it . . . drawworks, mud pumps, auxiliary power, full-time power, for pipeline pumping . . . for any high-horsepower diesel job. And if you've got reasons for wanting engines that spare the weight, these fit.

Both engines have twin turbochargers with divided aftercoolers—one for each cylinder bank—as standard equipment. There's a lot that's new and important about these engines. Your Caterpillar Dealer will be happy to tell you all about them. Be sure to specify Cat Engines to your supplier when you buy any petroleum equipment. Write for additional information.

THE 630 HP D379
This new Caterpillar Diesel V8 develops 630 HP @ 1300 RPM. As an electric set the rating is 350 KW continuous. The D379 requires only 30 sq. ft. of floor space.



THE 950 HP D398
950 HP @ 1300 RPM industrial engine rating and an electric set rating of 500 KW continuous make this Cat V12 Diesel one of the highest producers available for size and weight.

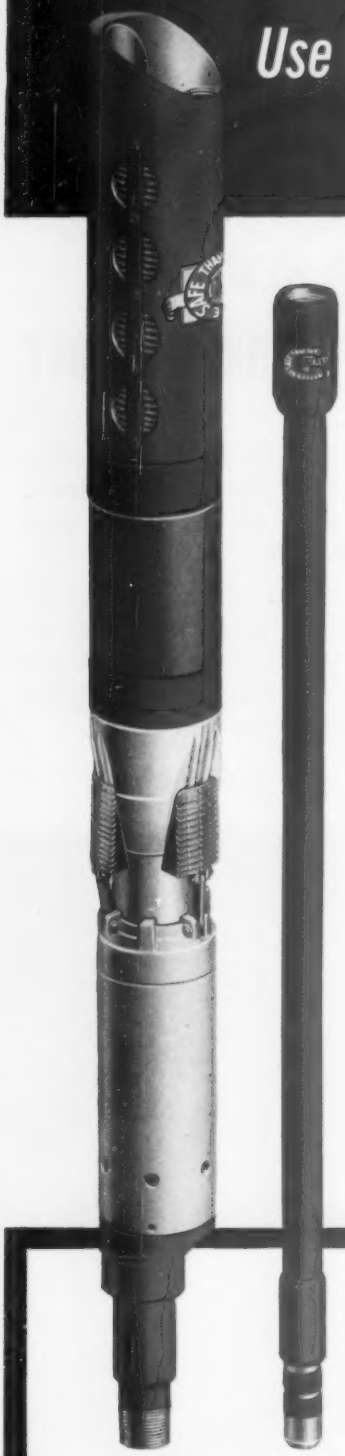
CATERPILLAR

Caterpillar and Cat are Registered Trademarks of Caterpillar Tractor Co.

Engine Division, Caterpillar Tractor Co., Peoria, Illinois, U.S.A.

For Dual String Completions – Flowing or Pumping

Use GUIBERSON'S RETRIEVABLE TYPE RD PACKER



Type RD Packer with Anchor and Plain Stinger

This cleanly designed, rugged packer is an outstanding Guiberson development for dual string installations in wells of any depth.

Outstanding in performance because it operates perfectly with both zones flowing, high or low differential pressure; with either zone flowing, the other zone pumping; with both zones pumping; with either or both zones on gas lift; or for multi-zone injection — gas or water.

Outstanding in advantages because it completely isolates each zone from the other and from the casing; provides full opening long string to lower zone; permits either string to be pulled or run separately.

Guiberson's RD packer does complex dual zone jobs so well that operators tell us it's their best investment for dual string production. Ask your Guiberson representative about installation and auxiliary equipment recommendations.

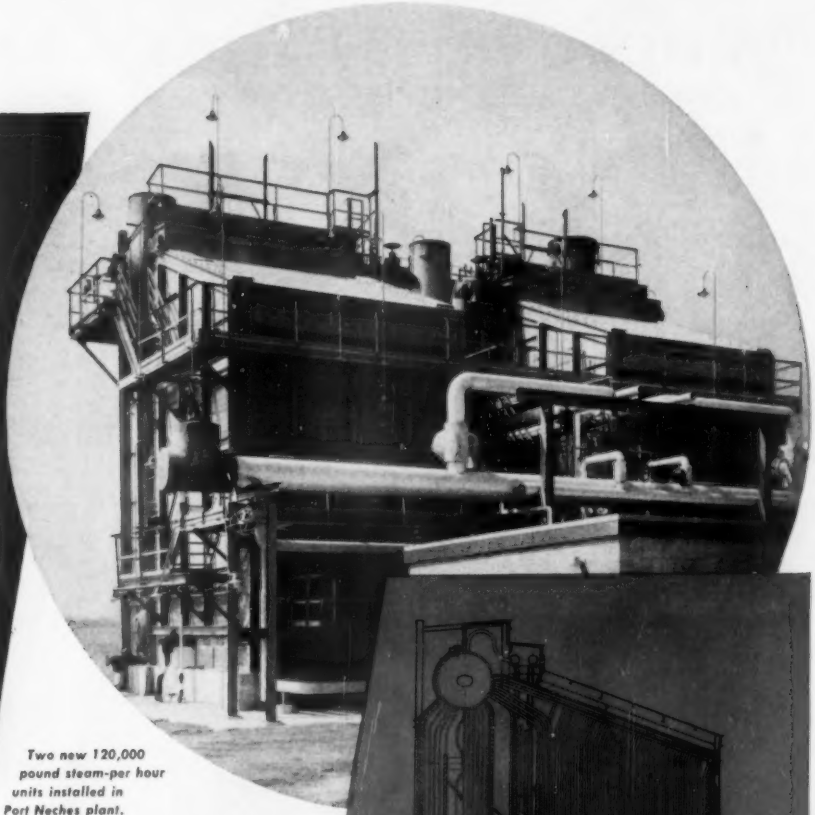
Guiberson's RD packer has smooth operating dovetail slips of heat-treated alloy steel. Packing rubber is one-piece sleeve type — will not vulcanize in the well, made of Guiberson's special oil and gas resistant compound. You can get the RD packer with or without anchor, and a choice of stingers, plain or with snap-ring. Piston slips have extra large gripping area, are heat-treated alloy steel and keyed to anchor body up to maintain proper alignment. Get the Best — Get Guiberson.

THE GUIBERSON CORPORATION

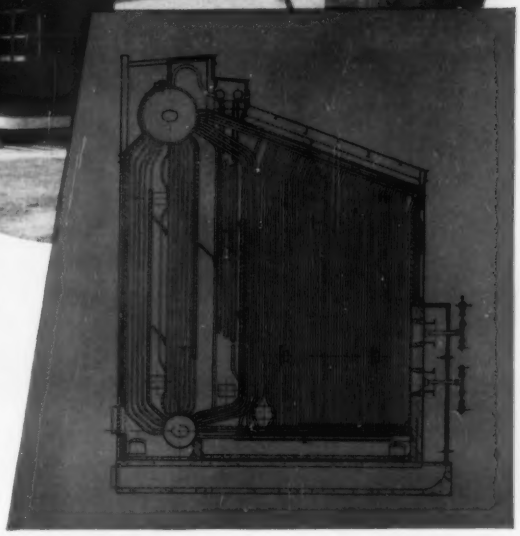
ESTABLISHED 1919
DALLAS, TEXAS
U. S. A.

Sold by
Oil Field Supply Stores
Everywhere

Steam for Jefferson Chemical by Vogt



Two new 120,000 pound steam-per hour units installed in Port Neches plant.



The needed additional power and process steam capacity for Jefferson Chemical's expanded Port Neches plant is furnished by the two Vogt boilers pictured here, each with a capacity of 120,000 pounds per hour. The boilers are designed for 675 lbs. pressure to operate at 625 lbs. pressure and 769°F. total temperature. The furnaces are equipped with gas burners and have water cooled front and side walls.

Bulletins describing Vogt boiler installations in a variety of industrial plants for power, processing and heating are available on request.

Installation by C. F. Braun and Co., Engineers.

For Custom Installation Bulletin VF-VS-2 • Package Unit Bulletin PSG-3, address Dept. 24A-BO.

HENRY VOGT MACHINE CO., LOUISVILLE, KENTUCKY

SALES OFFICES: New York, Chicago, Cleveland, Dallas, Camden, N.J., St. Louis, Charleston, W. Va., Los Angeles

Custom Built By..

STEAM GENERATORS

Vogt

Wherever Hungry Men Work

Wherever Good Food aids greater productivity you'll find competent, seasoned Universal personnel aiding the morale of valued employees. USI has served *40 million good meals* in areas that span the Western world. As specialists, we free your key people to pursue your profitable production while we keep the lid clamped tight on feeding and housing overhead. Universal brings to your operations measurably better service or lowered cost... frequently *both.*

Universal Services' new brochure illustrates what *we do, for* whom *we do it and details* how *we do it better. We welcome your request for a copy.*

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Heavy equipment and large crews are not required. Here, two men and a butt-fusion rig easily join and install large diameter pipe made of MARLEX.

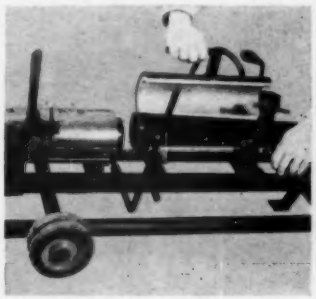
"Plastic pipe made of MARLEX* costs less to install... won't corrode... promises exceptional service"

Russell Lasater, President of Lasater Construction Company, Odessa, Texas, is sure that high density plastic pipe will soon be used for a great many oil and gas field applications. "We have installed some 50 miles of pipe made of MARLEX for gas gathering and salt water disposal in the last year and a half," he reports . . . "to the complete satisfaction of all concerned. Its initial cost is low . . . installation very economical . . . and, because it does not corrode, its service life should be exceptional." Mr. Lasater adds, "We can install lightweight MARLEX pipe at a faster rate than steel—using fewer men and without hoists or side-boom cats. Also, butt-fusion joining costs about 75% less than welding."

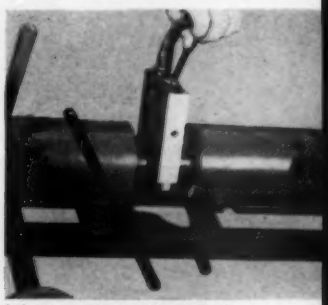
Today, coilable and straight lengths of pipe made from MARLEX TR-212 (ASTM Type III polyethylene) are enjoying ever wider use for gas distribution, gas and crude gathering, salt water disposal, water supply lines and the like. MARLEX pipe is tough, durable, and easy to install. It has good load bearing characteristics, a wide usable temperature range, and is virtually indestructible . . . resists acids, solvents, alkalies, bacteria, rot and fungi.

*MARLEX is a trademark for Phillips family of olefin polymers.

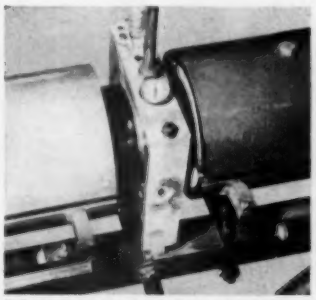
Low-Cost Butt-Fusion Makes Strong Joints Quickly and Simply!



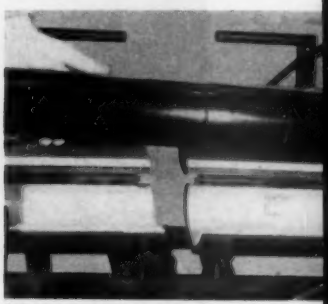
(1) Pipe is clamped in portable fusion rig.



(2) Thermostatically controlled heating plate is inserted.



(3) Ends to be joined are heated in a matter of seconds.



(4) No waiting . . . joint is even stronger than pipe.

For more information, see your pipe supplier . . . or contact us.

PHILLIPS CHEMICAL COMPANY

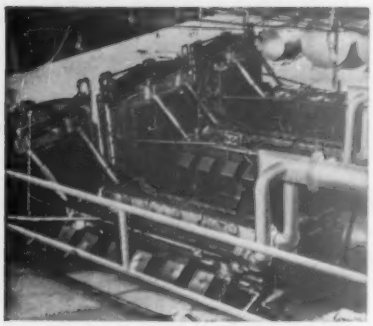
Bartlesville, Oklahoma

A subsidiary of Phillips Petroleum Company

PHILLIPS 66 MARLEX PLASTICS

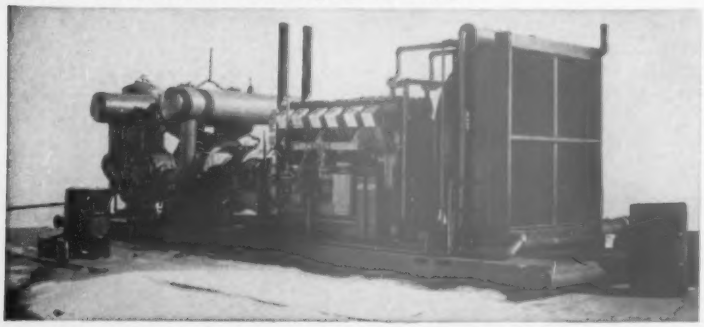
it's CLIMAX

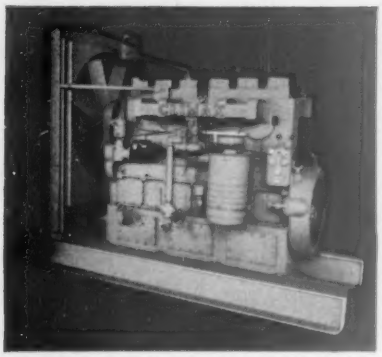
for DRILLING and PUMPING



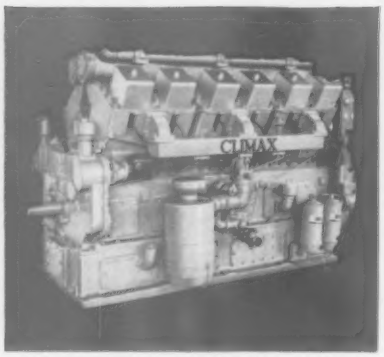
● Climax Engines have proven their reliability in hundreds of oil field installations. Single, well balanced design, rugged construction, and quality materials make them smooth running . . . for years!

for COMPRESSORS





Model K-67—Max. hp 265 (Natural Gas)



Model V-125—Max. hp 605 (Natural Gas)

Model V-85—Max. hp 390 (Natural Gas)

CL-116

CONT. DUTY (NAT. GAS) →			DRILLING-PUMPING (80% RATINGS)						COMPRESSORS (65% RATINGS)				
Model	Bore & Stroke	Displ.	Peak Torque @ RPM	Brake hp at Speeds Indicated					Peak Torque @ RPM	Brake hp at Speeds Indicated			
				600	800	900	1000	1100		800	900	1000	1030
R-165	6⅛ x 7	1238	684 @ 750	81	105	117	127	135	557 @ 800	85	95	103	105
K-67	7 x 7	1616	955 @ 850	110	145	161	176	188	775 @ 800	118	131	143	146
K-75	7½ x 7	1855	1090 @ 800	126	166	185	204	218	885 @ 800	135	151	166	169
V-80	7 x 7	2155	1240 @ 850	140	188	210	230	246	1002 @ 800	153	171	187	190
V-85	7½ x 7	2474	1460 @ 800	164	223	246	266	284	1185 @ 800	181	200	216	221
V-122	7 x 7	3232	1920 @ 800	217	293	328	353	378	1562 @ 800	238	265	288	293
V-125	7½ x 7	3711	2240 @ 850	242	340	384	417	442	1820 @ 900	276	312	340	346

CLIMAX ENGINE MANUFACTURING CO. • DIVISION OF WAUKESHA MOTOR COMPANY
FACTORY—CLINTON, IOWA

HOKE Flow Sheet 4
HOKE REPORTS ON FLUID CONTROL

HOW TO SWITCH PRESSURES IN MID-STREAM

PRESSURE BY THE POUND . . . no matter how thin you slice it!

One trouble with doing something better is that it's hard to stop. This time, we've come up with a new line of pressure regulators. We made them for the technically oriented who have developed high standards and for the penurious purchaser who wants something for (almost) nothing.

One, tagged as the 680 Series, is a highly stable single stage regulator with something for just about everyone. The core of this regulator is its control accuracy of 2% at flows to 2000 SCFH. Two models are available. One delivers 0 to 40 psi and the other 0 to 140 psi and both can handle inlet pressures up to 3000 psi. Use them on any gas compatible with 2024-T4 aluminum alloy, neoprene, polyurethane and Buna-N.

If what we've said sounds good so far, but still won't solve your problems, read on.

We've built a regulator specially for corrosive gases and atmospheres. Available in either all monel or all stainless steel construction, we call it the 640 Series. Spec sheets on this can be had by marking an "X" below.

If you "X" the next box, you'll get a package of useful information on a special regulator that will handle delivery pressures up to 4500 psi with very high control accuracy. This is a 2 stage spring and dome loaded regulator and we claim that a 50% change in inlet pressure will not change the delivery pressure more than 2%. Operation is simplicity itself. For no particular reason, we call this the 920 Series.

Skeptics should send for all of this information.

For reasons now hidden by the veil of tradition, no one has ever attempted to scrunch a pressure switch to its proper proportions—that is, until now. With sales getting bigger from making things smaller, we decided that this was the path to profit. Ergo; the new Hoke Pamar pressure switch.

This isn't just a case of arrested development, but something entirely new. The scrunching process necessitated less parts, so conventional connecting linkages were the first to go. The direct result: a switch with only one moving part—nothing to wear and upset the actuation setting.

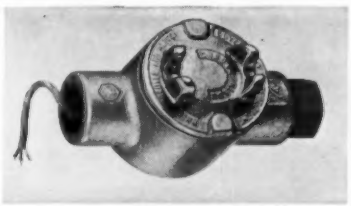
The ordinary bellows was out of the question, so we used a Ni Span C capsular type sensing element. Out of this came such things as high repeatability, minimum hysteresis and drift, maximum temperature stability, and a dead-band of minor significance.

The whole assembly measures less than 2 inches from tip to terminals, and weighs short of one ounce. Despite these diminutive dimensions, it is capable of handling working pressures to 500 psi with a repeatable accuracy of ±0.5%. Electrically, it sports a snap-action switch that will conduct a current of up to 7 amps to a variety of connectors – AN, cabled leads, solder terminals, or whatever you want. Interested in pressure switches for explosive atmospheres? Specify the explosion-proof model.

A special low pressure switch (0 to 7 psi) defies competition with a dead band of 2" of water!

If what you're looking for in a pressure switch seems impossible to find (even with the wonders we've described here), we'd like to hear about it. We thrive on doing what others shrink from, and will build a switch to your specs. Write and tell us your problem.

We could go on, but that wouldn't leave us with the usual advertising "hooker". We want to hear from you. In return, we'll send you the rest of the story.



WHAT'S NEW FROM HOKE?

Lots of things have been happening at Hoke. To be sure you're up to date on these developments in fluid control see your nearest distributor. He'll have something new for you every other month this year.

Hoke's Performance Guarantee—*Every Valve Leak-Tested!*

HOKE INCORPORATED
63 Piermont Road, Cresskill, N. J.

Send me complete information on the Hoke products checked below:

- ☐ Pamar Pressure Switches
- ☐ 680 Series Regulator
- ☐ 640 Series Regulator
- ☐ 920 Series Regulator
- ☐ "What's New"

NAME _____ TITLE _____
COMPANY _____
ADDRESS _____
CITY _____ STATE _____

SEE OUR CATALOG IN SWEETS PRODUCT DESIGN FILE

BEND

When you measure performance by the cost per mile, count on line pipe from Youngstown

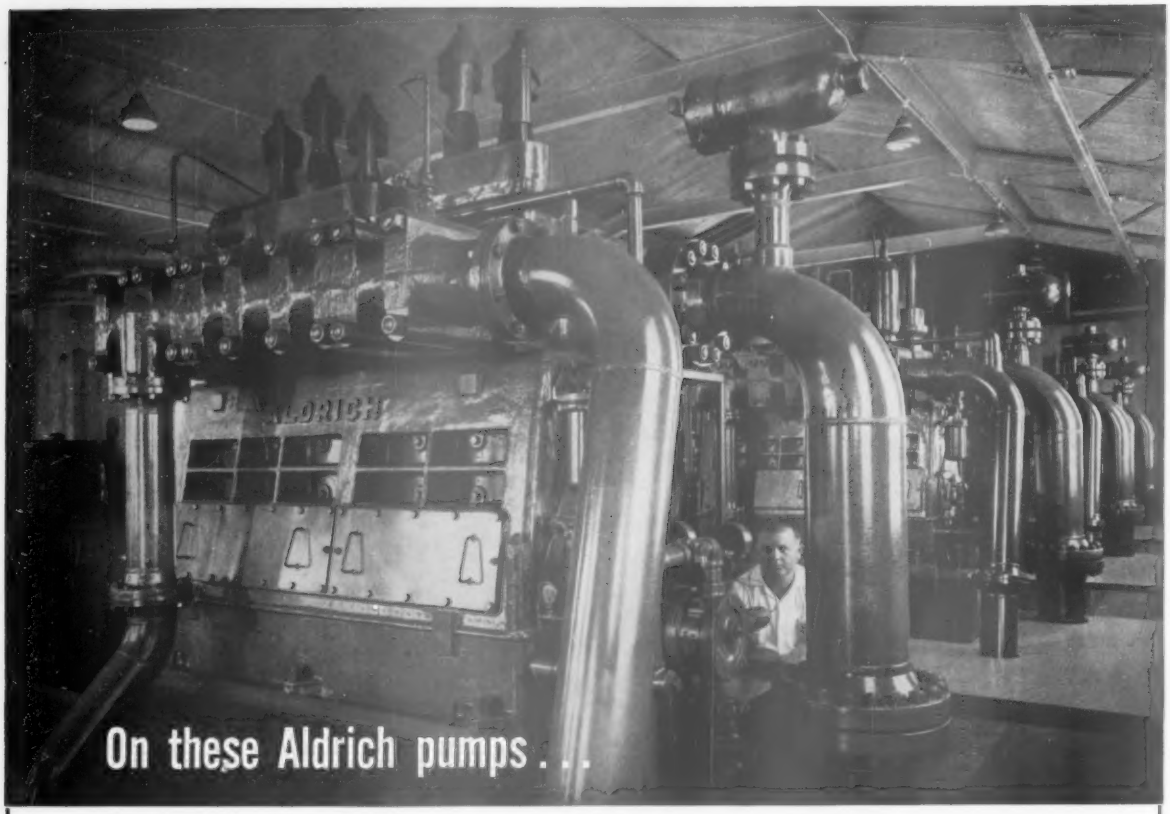
Work with Youngstown line pipe in the field. String it. Bend it. Cut it. Weld it. Lay it. See how round and straight it is. Watch how it hugs each contour. Line pipe from Youngstown is made to deliver all the characteristics and trouble-free performance that makes your low cost system a far better one.

All Youngstown electric weld line pipe 12¾" O.D. and over is hydrostatically expanded. Brute power of water pressure works the metal, expands it, strengthens it. Each length is given roundness and straightness. Result . . . better welding and bending qualities. And on all Youngstown line pipe, precision tests and quality controls assure the high standards of performance you demand.

Order Youngstown electric weld line pipe in sizes 6⅝" through 22" O.D. Name your coating, if you need one. Order it in faster-laying lengths averaging over 50'. Get fast delivery where and when you want it, through Youngstown District offices, or through 900 independent pipe distributors. For transmission, distribution or gathering systems, always specify line pipe from modern Youngstown, the world's second largest producer of quality pipe.

Youngstown – growing force in steel

For full details on Youngstown Electric Weld Line Pipe, write, Dept.18-A,
The Youngstown Sheet and Tube Company, Youngstown, Ohio



GULF OIL REPORTS 6 YEARS OF CONTINUOUS SERVICE WITH MINIMUM MAINTENANCE

FIELD REPORT

FLOOD: Goldsmith-San Andres Unit
OPERATOR: Gulf Oil Corporation
PUMPS: 4 Aldrich Quintuplex
FLOODING STARTED: October, 1954
EXPERIENCE TO DATE:

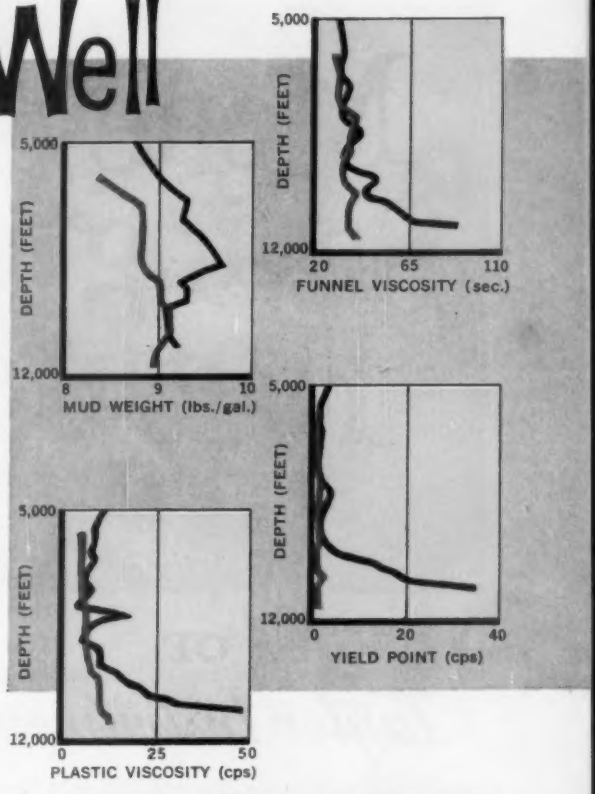
After six years, three pumps operate 24 hours a day, delivering some 54,000 bbl/day of sour oil field brine at 750 to 800 psi. Station designed for automatic operation. All maintenance handled by one man during eight-hour work day.

Field Parts stock available in Houston, Odessa, Alice and Wichita Falls, Texas; Casper, Wyo.; Hobbs, N.M.; Carmi, Ill.; Charleston, W. Va., Tulsa, Okla.; Los Angeles, Calif.; Calgary, Ontario. For further information write the ALDRICH PUMP COMPANY, 9 Gordon Street, Allentown, Pa.

the tough pumping problems go to ALDRICH

ATLAS EMULSIFIER saves $13,710 on Wyoming Well

Better flow properties, lower solids, less oil used plus savings of $13,710 in bits and rig time! Such is the record established by Signal Drilling and Exploration Company on Government Ackridge No. 1 for operator Max Pray. Located in the Grizzly Buttes Field of Unita County, Wyoming, Government Ackridge No. 1 was compared with a nearby well in adjacent Sweetwater County. With rig size and other drilling factors being equal for the comparison interval of the two wells, the savings effected are directly attributable to the difference in mud programs. From the intermediate casing point both wells were drilled with an oil emulsion . . . Government Ackridge No. 1 used an Atlas Emulsifier. In this 6,000′ interval Government Ackridge No. 1 was drilled in 188 fewer hours using 10 fewer bits—a clear saving of $13,710 in addition to a substantially lower mud bill.



ATLAS EMULSIFIERS IMPROVE A GOOD DRILLING FLUID
Because Atlas oil-in-water emulsion muds provide better oil action, they improve hole conditions, extend bit life, and increase penetration rates.

Better Hole Conditions. Atlas oil emulsion decreases torque as much as 50% . . . the hole is kept cleaner and pump pressures are correspondingly lower. There is less danger in lost-circulation and low-pressure zones.

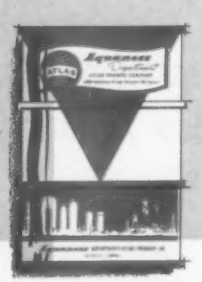
Longer Bit Life. Atlas oil emulsion prevents balling, provides better cutter and bearing lubrication. Greatly extended bit life reduces bit costs, reduces rig hours lost to trip time.

Faster Drilling Rates. Atlas oil emulsion makes more feet of hole per hour. Oil lubrication combines with improved hole condition to increase drilling rates in competent and troublesome formations.

Atlas emulsifier is sold through distributors under these tradenames . . . each is the product of Aquaness Department, Atlas Powder Company:

TRIMULSO®
Distributed by Baroid Division, National Lead Company
Registered trademark Baroid Division, National Lead Company

DRILLING MILK
Distributed by Magnet Cove Barium Corporation
Registered trademark Magnet Cove Barium Corporation

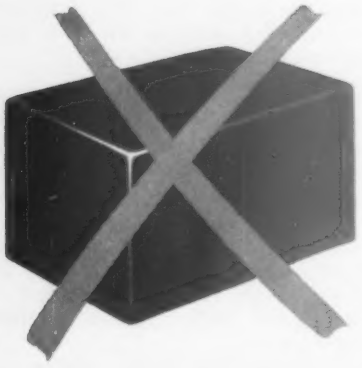


ATLOSOL
Distributed by Milwhite Mud Sales Company and other selected mud companies
Registered trademark Atlas Powder Company

Aquaness CHEMICALS
ATLAS POWDER COMPANY

Aquaness Department, Atlas Powder Company
P. O. Box 21072 • Houston 26, Texas

ANOTHER Money Saving Feature OF *Taylor Instruments*



ELIMINATION OF EXTERNAL "BLACK BOXES"

Today it is no longer necessary to clutter up your instrument panels with externally mounted "black boxes" for the operation of auxiliary devices such as process alarms, slidewires, etc. With Taylor TRANSCOPE® Recorders, both pneumatic and electronic, these functions can be built into the recorder. You save money . . . and labor . . . and panel space . . . and many headaches.

The secret is Servo Power. Powerful Servomatic motors built into the recorders not only give greater recording accuracy than ever before, but also supply the power necessary for precision operation of auxiliary mechanisms and computing devices. Power in the pneumatic servo is 150 greater than in the bellows-actuated type; in the electronic, it's 1,000 greater than galvanometer systems.

With this abundant power supply you can operate integral high-low process alarms for about 1/3 the cost of separate "black boxes"; retransmitting potentiometers for half the usual price of external transducers. Function generation and digital encoding can also be accomplished within the recorders at even greater savings.

* * *

When you buy TRANSCOPE *instrumentation you're buying greater accuracy than ever before available—and you're insuring against future process control needs. Ask your Taylor Field Engineer for a demonstration, or write for* **Bulletin 98286** *(pneumatic) or* **98335** *(electronic). Taylor Instrument Companies, Rochester, New York, or Toronto, Ontario.*

Taylor Instruments
MEAN ACCURACY FIRST

ARMCO CASING
Gets to You Fast, Goes in Fast

Strong
Durable
Economical

Rugged, lightweight Armco Casing is delivered *where* and *when* you need it. There are no delays to hold you up. Distributed by National Tank Company from 26 stocking points located throughout the oil country, Armco Casing is available in sizes from 6 to 24 inches.

In addition to quick delivery, Armco Casing can save you money by reducing running time. Supplied in exact 40- or 50-foot lengths, there are fewer joints in the string. Faster running is the result. Also, uniform lengths help you quickly determine the footage in the hole or in the stockpile at any time.

For information about how Armco Casing can serve *you,* mail the handy coupon.

Armco Drainage & Metal Products, Inc.
6441 Curtis Street, Middletown, Ohio

Send me more information about Armco Casing

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ARMCO Drainage & Metal Products

Better Production Tools Through Research

OTIS Equipment NEWS

Volume III, Number 2 Otis Engineering Corporation • Dallas *Production Equipment and Services*

Otis 1¼" I. D. Gas Lift Valves Lift 370 BWPD From New Tubingless Completion Gas Well

LAKE CHARLES—A major Southern Louisiana producing company recently used Type C Otis Macaroni String Gas Lift Valves to unload water from a new tubingless completion to save several thousand dollars in swabbing costs. In excess of 18,000 barrels of water were lifted through the 1¼" I.D. tubing and Otis Gas Lift Valves in less than two months time. Following the unloading operation, the pipe was salvaged and the valves exchanged for a new set of a different size for use in one of the company's oil wells.

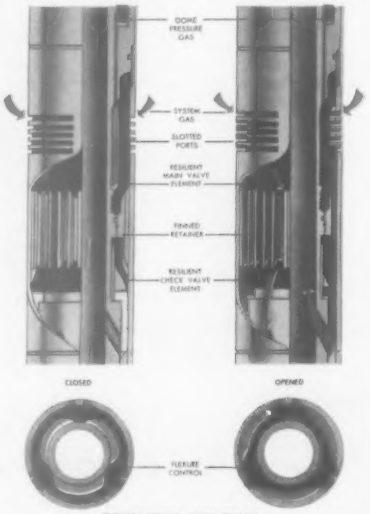
TYPE C OTIS GAS LIFT VALVE

Well conditions at the time the Otis Gas Lift Specialists made their recommendations were as follows: T.D. of the well was 7300 feet. 2⅞" tubing had been run and cemented to serve as a casing. Water encroaching from the down-side of the producing horizon was preventing production.

At the recommendation of Otis Gas Lift Specialists, the operator ran 7250 feet of 1¼" tubing with a packer on the bottom, and nine 1¼" Type C Otis Macaroni String Gas Lift Valves made up in the string. The lowest valve was located at 5900 feet. Using a 900 lb. supply gas system, an average of 370 barrels of water per day were lifted from a valve located at 4400 feet. The injection gas ratio was less than 300 cubic feet per barrel of water. The operator credited Otis Gas Lift Specialists with saving him swabbing costs of between $4,000 and $6,000.

Valve Design Features

Otis Macaroni String Gas Lift Valves provide the same outstanding design features to be found in the larger, standard size Type C Otis Gas Lift Valves. Available in sizes ranging from 1-13/32" to 3" I.D., Type C Valves have a full-opening bore, collar O.D. and tubing I.D., are concentric in design, have only two moving parts — no moving metal parts, no bellows to fatigue, no seat to cut out and no spread. The valve has one operating pressure — the set pressure of the valve.



OPERATING PRINCIPLE TYPE C OTIS GAS LIFT VALVE

Otis Gas Lift Valves are designed to provide the ultimate in lifting efficiency and capacity, and for use in continuous or intermittent lifting operations without modification. Type C Otis Gas Lift Valves with Pack-Off Assemblies are currently being used to convert wells to gas lift without pulling the tubing. This technique of converting a well to gas lift saved one producer as much as $60,000 in converting three readily accessible land wells.

Otis Gas Lift Specialists and Completion Specialists are interested in helping you complete and produce your wells in the most efficient way possible. Their experience — gained through years of solving difficult production problems encountered in all the major producing areas of the world — will prove invaluable to you. Use the knowledge of these men and spend your production dollars more economically and efficiently. For more information on Otis Gas Lift Valves, sizes and lifting capacities, contact your nearest Otis office or write Otis, Dept. E-2, P. O. Box 35206, Dallas 35, Texas. You'll find experienced Otis Gas Lift and Well Completion Specialists ready to help you . . anxious to serve you . . and with the widest variety of field proven production equipment and services available today.

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Engineering OTIS Corporation

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SALES ARE OFF
on slush pump parts
AND WE LIKE IT!

Considering the great number of Continental-Emsco slush pumps running, orders for replacement parts are surprisingly few. This we like. Our customers like it even better. It means they are able to keep drilling contracts *on schedule* with less costly downtime.

Routine maintenance on C-E pumps is fast and simple, with automatic lubrication . . easy-to-open valve pot covers for quick valve inspection or replacement . . "exposed" liner design to help prevent washouts and "sanding-up." These and many other Continental-Emsco pump features have been proven under the world's toughest drilling conditions for nearly 25 years.

You can cut your parts bill and downtime, too. Call a C-E man and talk slush pumps.

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Serving the Oil and Gas Industries . . Worldwide

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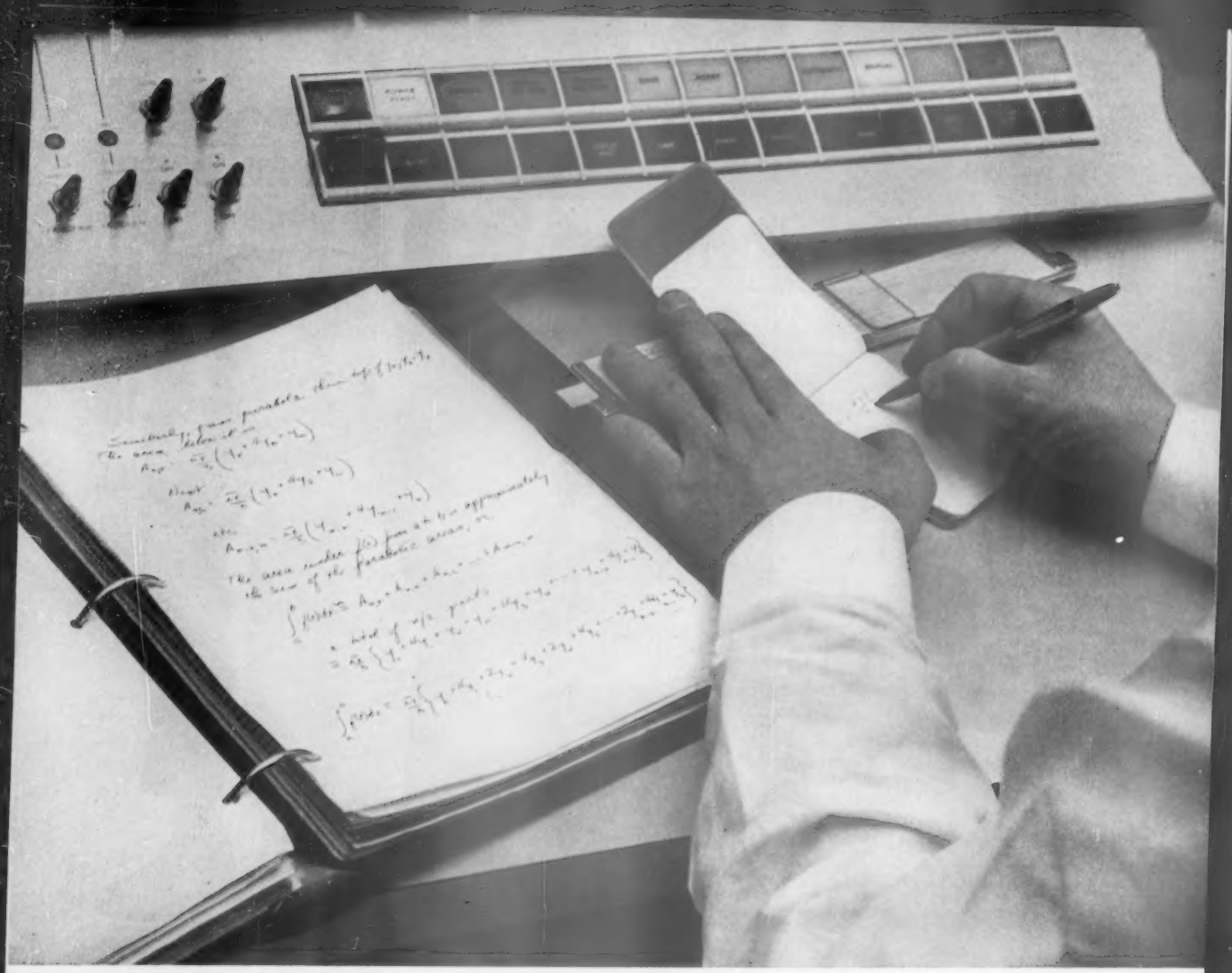


Free engineers for creative assignments with the new low-cost IBM 1620

The IBM 1620 Data Processing System is a low-cost solution to the problem of freeing engineers for their most creative and profitable assignments. Here's why:

EASY TO USE—Just a two-day training class is all you need to put your 1620 into operation. This means no delays in learning to use the 1620 computer.

In addition, you get a wide range of free programming services including FORTRAN and GOTRAN. FORTRAN is the powerful scientific language that lets you solve problems without writing detailed computer instructions. GOTRAN is a simplified language (a sub-set of FORTRAN) that lets you enter simplified problem statements and data into the computer with the solution immediately available, in one simple operation.

FAST—The 1620 solves a set of ten simultaneous equations in only 20 seconds. It inverts a 10 x 10 matrix in just 42 seconds.

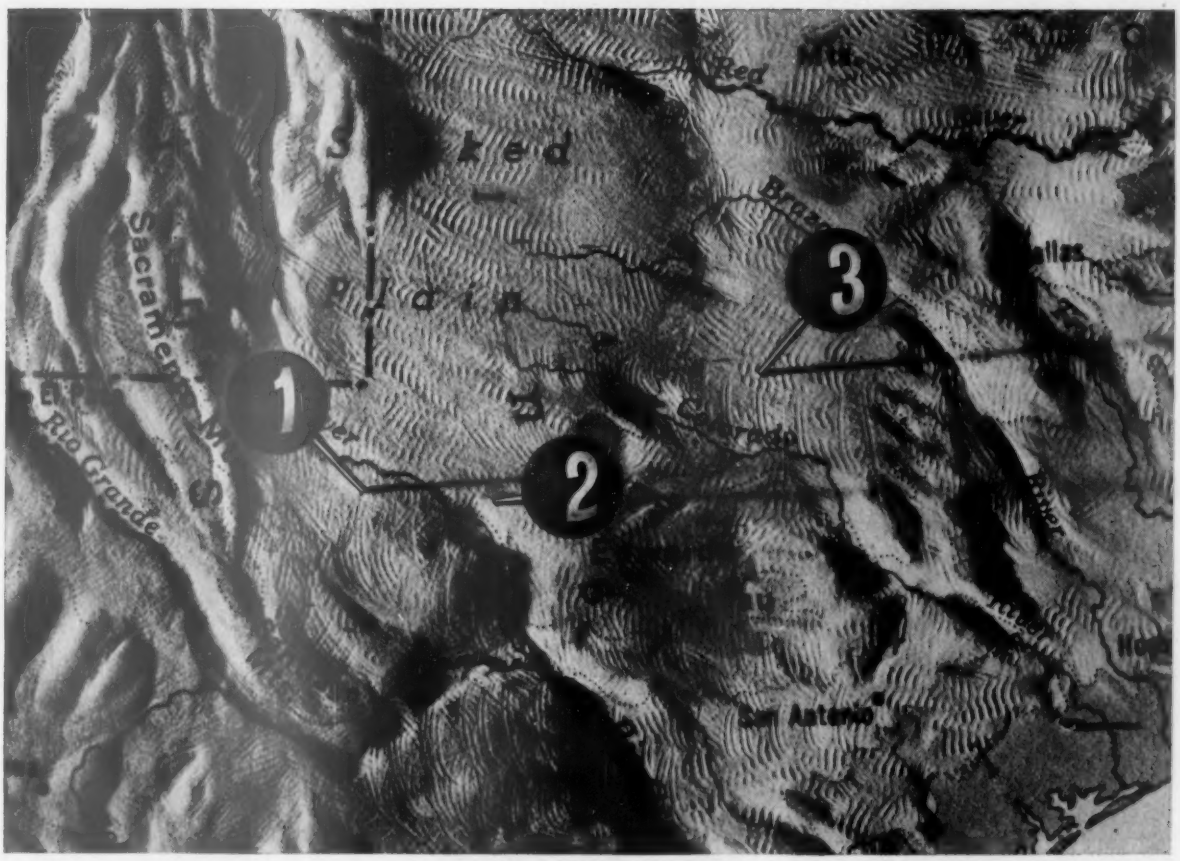
POWERFUL—The 1620 inverts a 40 x 40 matrix. With optional additional core storage the 1620 can handle matrix inversion problems of a much higher magnitude.

GET FULL DETAILS—The 1620 is the most outstanding engineering and scientific computer in its price range. A basic installation rents for just $1,600 a month.

To learn how the 1620 can free you for more creative engineering work, call your local IBM representative.

IBM's 1620 is a compact desk-size computer.

IBM
DATA PROCESSING



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Hagan Controlled Solubility Phosphates Stop Calcium Carbonate Scale

Many areas in West Texas have serious calcium carbonate problems. Rods and tubing become completely coated with scale, and production must be held up while the well is pulled and mechanically cleaned. Here are some case histories that show how Hagan's Controlled Solubility Phosphate, type 15-J, lowered costs by keeping production up and eliminating the expense of pulling and cleaning.

1 In the Pecos Valley area of Texas, a major oil company had a well making 65 BOPD with 61% water. When the pump froze and the well was pulled, rods and tubing were found to be coated with calcium carbonate scale. Deposits had even started on the collar.

Treatment with Hagan's 15-J was initiated, and the well was pulled forty-five days later to check on the effect. Pumping rods were perfectly clean and 85% of the scale had been removed from the tubing. The 15-J had not only prevented further deposits, but had also removed most of the accumulation. This operator is very satisfied with his savings.

2 This well in west central Texas was producing 60 BOPD and 15 BWPD. Due to accumulations of calcium carbonate scale, it was being pulled every 23 days at a cost of $150.00 to $200.00. To eliminate this cost, Hagan 15-J, Controlled Solubility Phosphate was tried. The 15-J was applied downhole, with an initial charge of about 15 pounds, and an additional charge of two to three pounds every two weeks. Since the start of treatment 14 months ago, there has been no need to pull this well—a very substantial saving for the operator.

3 Heater treaters in this area became so clogged with calcium carbonate scale that shutdown and cleaning was necessary every 30 days. Since every shutdown cost in excess of $60, the major oil company operating the field looked for a solution. They found it in 15-J. Treatment was initially maintained for a 90-day test period. At the end of this time, complete inspection of the heater treaters showed only traces of scale. Treatment with 15-J was continued and another inspection after 6 months found spotlessly clean firetubes with no indication of scale.

For information on how Hagan's complete line of Controlled Solubility Phosphates can help you, write or phone the address below.

HAGAN—Your Only Complete Source of Water Conditioning Equipment, Water Treatment Chemicals, Field Laboratories, Engineering Service.

HAGAN
CHEMICALS & CONTROLS, INC.
HAGAN CENTER, PITTSBURGH 30, PA.

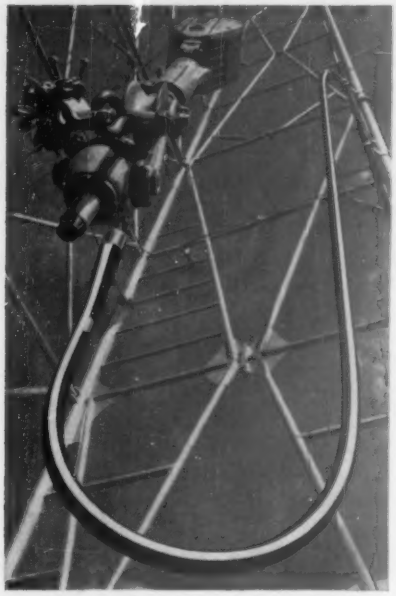
HAGAN DIVISIONS: CALGON COMPANY • HALL LABORATORIES • BRUNER CORP. • BRADFORD LABORATORIES

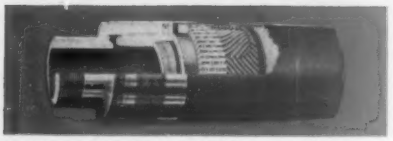
Keep jobs moving with THERMOID Big T Hose

Thermoid hose handles the big, important petroleum jobs with ease. Reliability of product and availability on a moment's notice keep jobs on schedule by holding down-time to a minimum. Ask your Thermoid Big T distributor for the specific hose you need to fill any application in the petroleum field. For information, write Thermoid Division, 200 Whitehead Road, Trenton 6, New Jersey, or phone JUniper 7-3000.

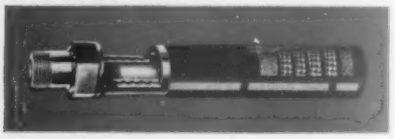
Quaker Thermoid

ROTARY HOSE for slim hole or production drilling



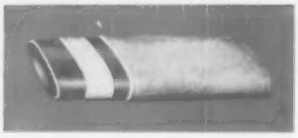


POWERFLEX GOLD STRIPE. Proof-tested to 7,500 lbs. pressure for safe operation at any pump pressure, with plenty of reserve strength to prevent blow-outs. Extra heavy abrasion-resistant cover. Sizes 2½" to 4".



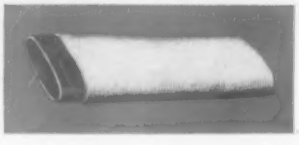
TRIOFLEX. Cover of tough, black, oil and grease resistant synthetic rubber specially compounded for maximum service under all weather conditions. Unusual flexibility and resistance to kinking permits coiling in 36" coil. Sizes 2" to 3".

FIRE HOSE for protection of ship and shore installations



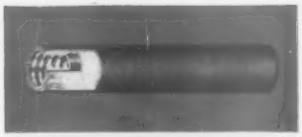
PORTER D. J. DELUXE. Double-jacketed 100% synthetic hose designed specifically to resist mildew and rot . . . can be repacked wet, ready for immediate use. First bonded all-polyester fiber double jacket. Test pressure 600 p.s.i. Lengths to 50'. Size 1½"-2½".

PETROCHEM. First hose designed specifically for oil and chemical industries. It is 100% polyester fiber jacketed for high pressure service under oily and abrasive conditions. Resists heat to 300°F. Sizes 1" to 2½".



SUPER-QUAFLEX. Constructed with an all-neoprene tube that is completely oil resistant. Lightweight, flexible and easy to handle. Will not kink and can be recoiled with a minimum of effort. Factory Mutual approved in 1½" and 2½" sizes; 50', 75' and 100' lengths.

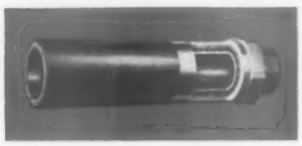
SUCTION AND DISCHARGE HOSE for oil and gasoline



POWERFLEX. Designed for conveying aromatic solvents. Guaranteed for 2000 hours of service. In sizes 2½", 3", and 3½"

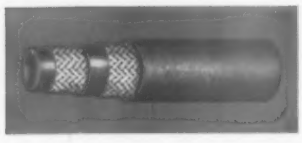
EBONITE. Multiple plies of strong, closely woven heavy-duty duck, frictioned with high grade rubber compounds for firm bonding and high burst resistance. Lengths to 50'; sizes 3" to 12". (Also available in "Quaflex" grade with fire cord reinforcement.)

BLOWOUT PREVENTER HOSE all pressure operated units



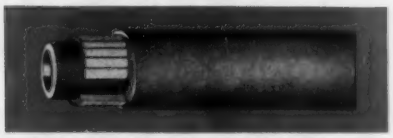
Wire braid construction and special pressed on couplings provide more than ample safety margin for handling any pressure found in operating blowout preventer equipment. In 1" 2-braid or 1¼" 3-braid.

GENERAL SERVICE HOSE for varied jobs

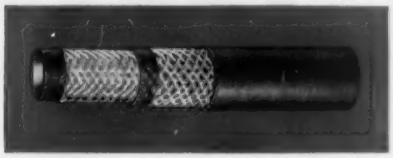


VERSICON. Most versatile molded hose ever offered. Particularly recommended for air-operated tools in general industrial applications. Suitable for water, oil, grease, solvents or sprays. 22 sizes from 3/16" to 1½".

STEAM HOSE for petroleum field service

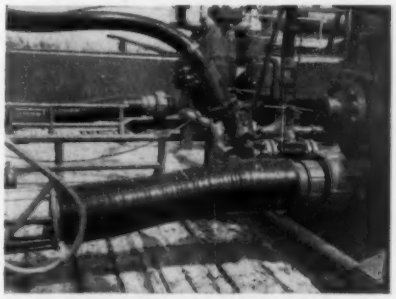


SUPER-IRONSIDES. For extra heavy service in refineries and oil fields. Designed to maintain full flow of saturated steam up to 388°F. at 200 lbs. operating pressure. Kink-proof and flexible. Steel braid reinforcement provides static dissipating feature. Black cover of synthetic compound is resistant to heat, chemicals, abrasion and weather. Lengths to 50' in ½" to 2" sizes.



IRONSIDES. A general purpose hose that handles saturated steam up to 368°F. at 150 lbs. operating pressure. Braid steel wire construction with steel wire braid reinforcement imbedded in heat-and-chemical-resistant synthetic rubber. Withstands heat, chemicals, abrasion and weather. In lengths to 50' in ⅜" to 1" sizes.

SLUSH PUMP SUCTION HOSE for heavy duty pumping



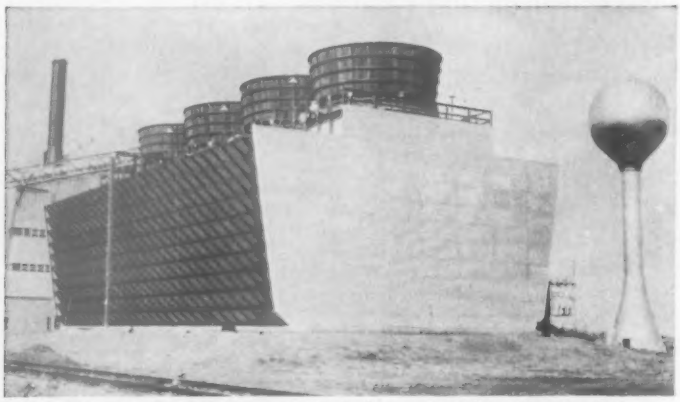
MUD FLO. Thick inner tube firmly bonded to a strong, open-weave breaker fabric. Heavy galvanized round wire reinforcement prevents collapse, affords maximum flexibility, absorbs pumping vibration and provides unobstructed flow. Sizes 4" to 12".

THERMOID DIVISION PORTER **H. K. PORTER COMPANY, INC.**

200 WHITEHEAD ROAD, TRENTON 6, NEW JERSEY

As a matter of public record, here are Marley's

1960 TOWER TESTS



This Class 600 Double-Flow is typical of towers tested (see Test No. 12)

Again Marley is pleased to present its "annual report" to industry—the consecutive results of all acceptance tests* of Marley industrial cooling towers made in 1960. This series of tests demonstrates that The Marley Company is adhering rigidly to its established policy that every cooling tower proposed shall have ample capacity to perform in accordance to purchaser's specifications . . . after compensating for every contingency that may affect operating conditions. Every plant or process served by these Marley towers operated with specified cooling capacity from start-up date; no delays for alterations or additions were experienced by any of these Marley customers.

Test No.	TYPE OF SERVICE AND LOCATION	SPECIFIED CONDITIONS				TEST RESULTS[2]	
		Gallons Per Minute	Hot Water Temp.	Cold Water Temp.	Wet Bulb Temp.	Degrees[1] Cold Water Temp.(F°)	Percent Capacity
1	Generating Station—Gulf Coast	20,000	102.0	87.0	80.0	+0.6°	+10.8
2	Generating Station—Southwest	58,000	105.2	86.0	70.0	+1.6°	+9.7
3	Generating Station—South	1,700	111.5	95.0	80.0	+0.8°	+4.8
4	Generating Station—South Central	800	105.5	90.0	76.0	+0.9°	+7.0
5	Generating Station—Mid-Central	11,850	102.5	90.0	78.0	+1.1°	+8.4
6	Chemical Plant—Northeast	5,100	105.0	85.0	75.0	±0.0°	±0.0
7	Generating Station—Southwest	36,800	102.6	81.3	67.5	+0.6°	+3.8
8	Generating Station—Gulf Coast	116,200	110.7	92.0	76.0	+0.25°	+1.7
9[3]	Petroleum Refinery—Mid-Central	22,500	99.1	85.0	75.0	+0.1°	+0.7
10[3]	Generating Station—Southwest	63,000	106.0	90.0	75.0	±0.0°	±0.0
11	Air Conditioning—Mid-Atlantic	18,000	96.0	86.0	79.0	+0.1°	+1.25
12	Generating Station—Mid-Central	30,000	103.0	87.0	75.0	+0.7°	+5.0
13	Chemical Plant—Mid-South	9,000	102.0	85.0	78.0	+1.0°	+12.7
14	Chemical Plant—Mid-Central	9,200	110.0	80.0	71.0	+0.4°	+3.7
15	Air Conditioning—East Central	4,780	96.5	86.5	80.0	+0.85°	+10.6
16	Air Conditioning—East Central	2,940	98.8	82.7	78.0	+0.34°	+6.5
17	Air Conditioning—East Central	7,500	95.0	85.0	78.0	+0.3°	+2.45
18	Petroleum Refinery—South Central	10,000	117.0	85.0	76.0	+0.75°	+7.4
19	Generating Station—Mid-Central	26,000	98.0	85.0	75.0	+0.83°	+8.1
20	Generating Station—South Central	61,000	103.5	88.0	78.0	−0.24°	−1.8
21	Air Conditioning—North Central	5,850	99.0	89.0	80.0	+0.8°	+8.7

*Conducted in accordance with procedure specified by ASME Power Test Code, recognized standard for measurement of cooling tower capability.

NOTES: 1. + indicates lower cold water temperature than specified; — indicates higher cold water temperature than specified. 2. Test results adjusted to specified conditions. 3. CTI observer present during test.

Write for "TEST YOUR TOWER"

A revised edition of this technical publication details the Marley method of tower testing; will enable you to know the capability of your tower. Write direct or ask your nearby Marley engineer for copies for your engineering staff.

THE MARLEY COMPANY ● KANSAS CITY MISSOURI

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They Say—

Other barnacles

Dear Sir:

I read with some considerable interest your editorial of March 20 ("Barnacles on Oil's Ship of Progress," p. 59) regarding our scuffle over compulsory unitization here in Topeka.

While not wishing to debate the merits of that particular controversy, I do wish to point out that the attitude of most of the other states besides Texas and Kansas is not so laudable nor "progressive" in the area of market demand prorationing.

In the opinion of many, this failure on the part of these other states contributes as much as any other factor to the basic problem of the independent, namely an inadequate price for a barrel of crude.

Tom L. Schwinn
Executive Vice President
Kansas Independent
Oil and Gas Association

Second shot did the trick

Dear Sir:

On page 180 of your March 20, issue under the headline "Disappointments Mar Canadian Successes," there is found the following:

"Petitot River, a Western Natural Gas Co. discovery of late, has also come up with a dry offset this winter, as have both Kotcho Lake and Clarke Lake."

My purpose in writing is to advise you as to the subsequent events in regard to these three wells. Our exploratory success in this area, instead of being poor, has been extraordinarily good. The article gives an impression that the hunter missed on his first shot and went hungry. Our first shot in each case missed, but our second shot hit the target.

The Petitot River 1 well missed the Devonian reef by a narrow margin, and we simply sidetracked this well in toward the reef and completed it as an excellent gas well flowing from a thick section of middle Devonian reef at the rate of 10,250,000 cu. ft. of natural gas per day on a ½-in. choke. This well

extended the Petitot River field 1 mile to the southeast.

Our Kotcho Lake 5 well was abandoned as a dry hole; however, our Kathy 2 well extended the Kotcho Lake field 5 miles to the north. This well on test had an open flow potential of 148,000,000 cu. ft. of natural gas per day.

In the Clarke Lake field our Fort Nelson 5 missed the Devonian reef by a short distance, so we moved the rig 2,000 ft. to the south and dug our Fort Nelson 6. This well extended the Clarke Lake field 1½ miles to the west and is one of the biggest wells drilled in the area, having penetrated 350 ft. of porous dolomite and flowing at the rate of 10,300,000 cu. ft. of natural gas per day on ½-in. choke.

Henry O. Weaver
Vice President,
Western Natural Gas Co., Inc.

It's not a fuel cell

Dear Sir:

We were interested in reading your article on the thermoelectric generator we are using for cathodic protection (OGJ, Mar. 13, p. 96).

Technically this is not a "fuel cell." A fuel cell is a means of converting chemical energy directly into electricity through a device not unlike an ordinary storage battery.

The Institute of Gas Technology has such a cell powered by methane in its laboratory. To utilize methane, these cells must operate at rather high temperature and, so far, no commercial installations are on the market. The Armed Forces have fuel cells operating with other gases as the raw material. Allis Chalmers, you may recall, made headlines a couple of years ago with its tractor powered by a battery of fuel cells drawing their energy from propane.

The thermoelectric generator develops electricity from heat rather than from the chemical content of the gas.

Marvin Chandler
President
Northern Illinois Gas Co.

Letters to They Say should be addressed to The Editor, The Oil and Gas Journal, Box 1260, Tulsa, Okla.

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CALENDAR

APRIL

17-19 Instrument Society of America, symposium on instrumental methods of analysis, Shamrock Hilton Hotel, Houston.

18-20 University of Oklahoma, southwestern gas measurement short course, North Campus, University of Oklahoma, Norman.

19-20 University of Tulsa, fifteenth annual conference of accountants, University campus, Tulsa.

19-20 National Petroleum Association, semi-annual meeting, Hotel Sheraton-Cleveland, Cleveland.

20-21 Society of Petroleum Engineers of AIME, East Texas-Louisiana-Arkansas gas-technology symposium, Tyler, Tex.

20-21 Texas Technological College, annual West Texas oil lifting short course, Lubbock, Tex.

20-22 Illinois Society of Professional Engineers, annual convention, Peoria, Ill.

24-26 Southern Gas Association, meeting, New Orleans.

24-27 American Association of Petroleum Geologists, Society of Economic Paleontologists, and Rocky Mountain section of AAPG, annual meeting, Denver Hilton Hotel, Denver.

26-28 American Petroleum Institute, Division of Transportation, pipeline conference, Chase-Park Plaza Hotel, St. Louis.

27-28 Rocky Mountain Oil and Gas Association, midyear meeting, Northern Hotel, Billings, Mont.

28 Natural Gasoline Association of America, Oklahoma regional meeting, Lake Murray Lodge, Ardmore, Okla.

29 American Institute of Chemical En-

gineers, Oklahoma state meeting, University of Tulsa, Tulsa.

30-May 2 Independent Petroleum Association of America, midyear meeting, Roosevelt Hotel, New Orleans.

30-May 3 Liquefied Petroleum Gas Association, convention and trade show, Conrad Hilton Hotel, Chicago.

MAY

2-4 Purdue University, School of Civil Engineering, sixteenth industrial-waste conference, Purdue Memorial Center, Lafayette, La.

3-5 American Petroleum Institute, Division of Production, Rocky Mountain district meeting, Gladstone, Henning, and Townsend hotels, Casper, Wyo.

4-5 Society of Petroleum Engineers of AIME, oil recovery conference, Midland, Tex.

4-5 Pacific Coast Gas Association, Inc., transmission conference, Biltmore Hotel, Santa Barbara, Calif.

4-5 Illinois State Geological Survey, Illinois Basin chapter of AIME's Society of Petroleum Engineers, biennial petroleum engineering conference, University of Illinois campus, Urbana.

5-7 Indiana Geological Survey, Indiana Department of Conservation, University of Indiana department of geology, tenth geologic field conference, stratigraphy of the Silurian rocks of northern Indiana, Marion, Ind.

7-10 American Institute of Chemical Engineers meeting, Sheraton-Cleveland Hotel, Cleveland.

8-11 American Petroleum Institute, Division of Refining, midyear meeting, Rice Hotel, Houston.

8-12 American Gas Association, distribution and production conference, Sheraton Hotel, Philadelphia.

9-11 Western Joint Computer Conference and Exhibit, Ambassador Hotel, Los Angeles.

10-12 American Society of Mechanical Engineers, production engineering conference, Royal York Hotel, Toronto.

10-12 Canadian Institute of Mining and Metallurgy, oil and gas division, and Calgary and Edmonton petroleum engineering sections of Canadian Institute of Mining and Metallurgy and American Institute of Mining, Metallurgical, and Petroleum Engineers, annual meeting, McDonald Hotel, Edmonton, Alta.

11-12 American Petroleum Institute, Division of Production, Pacific Coast district meeting, Biltmore Hotel, Los Angeles.

11-12 Texas A. & M. College, thirteenth oil recovery conference, College Station, Tex.

12 Natural Gasoline Association of America, Permian basin regional meeting, Lincoln Hotel, Odessa, Tex.

14-17 Texas Independent Producers and Royalty Owners Association, Scharbauer Hotel, Midland, Tex.

16-19 American Petroleum Institute, Division of Marketing, midyear meeting, Americana Hotel, Miami Beach.

17-19 Western Petroleum Refiners Association, Mid-Continent regional technical-industrial relations meeting, Hotel Lassen, Wichita.

17-19 Society of Professional Well Log Analysts, second annual meeting and logging symposium, Sheraton-Dallas Hotel, Dallas.

21-24 American Petroleum Institute, Division of Transportation, midyear highway conference, Bellevue Stratford Hotel, Philadelphia.

24-25 Western Petroleum Refiners Association, computer conference, Ben Franklin Hotel, Philadelphia.

25 Pennsylvania Grade Crude Oil Association, annual meeting, Pennhills Club, Bradford, Pa.

25-26 American Institute of Mining, Metallurgical, and Petroleum Engineers, annual Rocky Mountain petroleum sections, joint meeting, Farmington, N. M.

25-26 American Gas Association, gas transmission conference, Brown Palace and Cosmopolitan Hotels, Denver.

JUNE

1-2 Kentucky Oil and Gas Association, annual meeting, Phoenix Hotel, Lexington.

1-3 Interstate Oil Compact Commission midyear meeting, Shamrock-Hilton Hotel, Houston.

5-6 Petroleum Electric Power Association, meeting, Mayo Hotel, Tulsa.

6-8 Instrument Society of America, summer instrument-automation conference and exhibit, Royal York Hotel and Queen Elizabeth Hall, Toronto.

6-8 Sixth annual Appalachian underground corrosion short course, West Virginia University, School of Mines, Morgantown, W. Va.

9-17 European Congress of Chemical Engineering and Achema Congress, thirteenth exhibition and congress of chemical engineering, Frankfort am Main, Germany.

11-15 American Society of Mechanical Engineers, summer annual meeting, Statler Hilton Hotel, Los Angeles.

12 Instrument Society of America and Air Pollution Control Association,

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Most susceptible to fatigue is thread root area, where notch effect exists.
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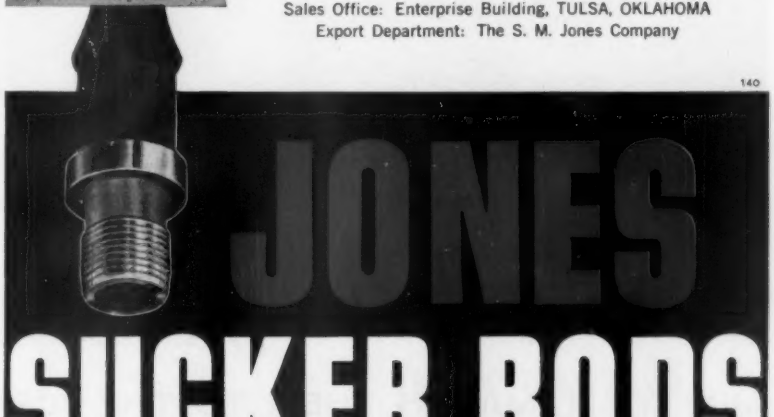

The lineup, left to right—Diaphragm actuator, globe body . . . Cylinder actuator, split body . . . Diaphragm actuator, split body . . . Cylinder actuator, globe body.

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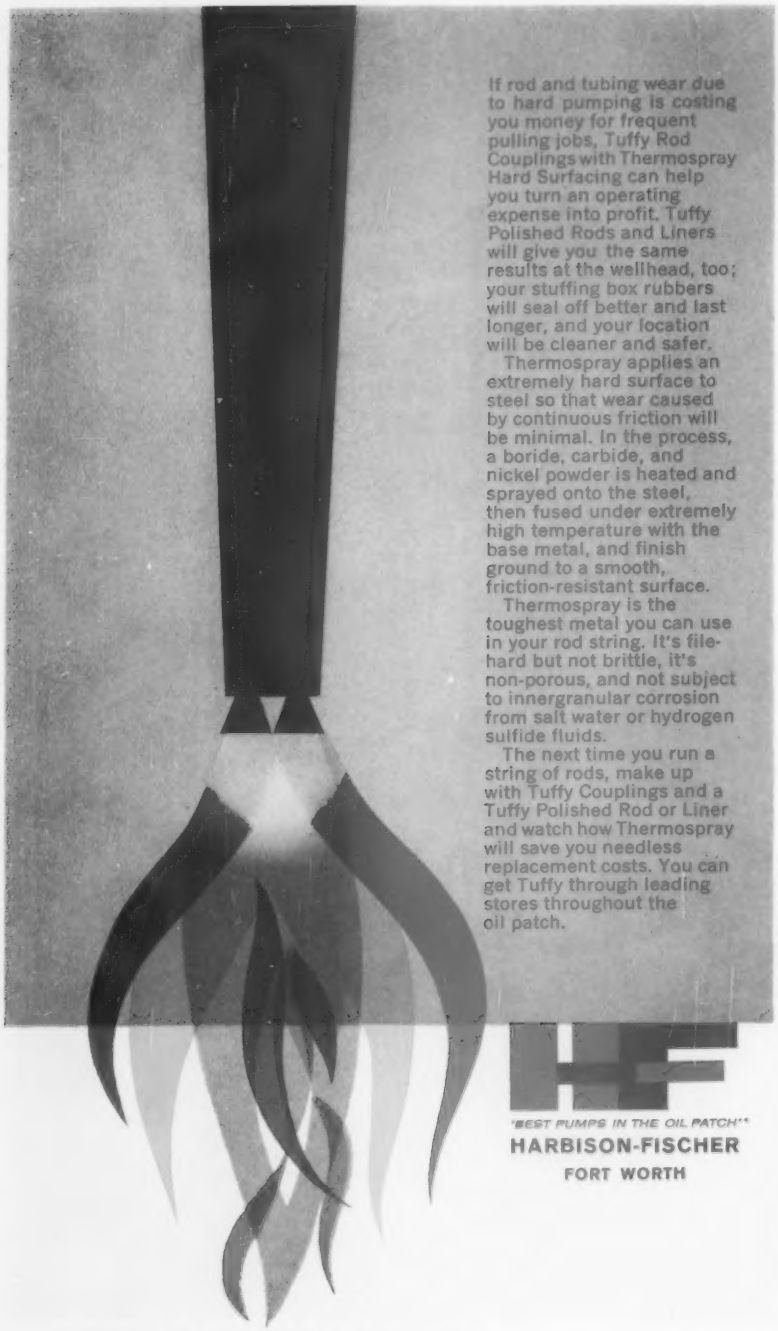

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HARD SURFACING

air pollution instrumentation symposium, Hotel Commodore, New York City.

12-14 American Petroleum Institute, Division of Transportation, annual tanker conference, Oyster Harbors, Cape Cod, Mass.

12-16 Gordon Research Conferences, petroleum, Colby Junior College, New London, N. H.

13-16 Instrument Society of America, biennial international gas chromatography symposium, Kellogg Center, Michigan State University, East Lansing, Mich.

19-23 Harvard University, School of Public Health, air cleaning institute, Cambridge, Mass.

19-23 Gordon Research Conferences, catalysis, Colby Junior College, New London, N. H.

20-24 Canadian Gas Association, annual meeting, Banff Springs, Alta.

22-24 American Association of Petroleum Landmen, annual meeting, Shamrock Hilton Hotel, Houston.

23-30 Instrument Society of America, joint automatic control conference, Boulder, Colo.

25-30 American Society for Testing Materials, annual meeting, Chalfonte-Haddon Hall, Atlantic City, N. J.

26-27 Michigan Gas Association, annual meeting, Grand Hotel, Mackinac Island, Mich.

26-July 7 Massachusetts Institute of Technology, summer program on dynamics and control of chemical engineering processes, Cambridge, Mass.

28-30 International Gas Conference, Stockholm, Sweden.

JULY

4-7 National Society of Professional Engineers, twenty-seventh annual meeting, Olympic Hotel, Seattle.

6-8 International Oil Scouts Association, annual meeting, Roosevelt Hotel, New Orleans.

10-21 University of Michigan, summer course on underground storage of natural gas, Ann Arbor, Mich.

26-28 American Petroleum Institute, Division of Production, eastern district meeting, The Greenbrier, White Sulphur Springs, W. Va.

AUGUST

2-4 Wyoming Geological Association, sixteenth annual field conference, Green River, Wind River, and Powder River basins.

28-Sept. 1 American Society of Mechanical Engineers, international heat transfer conference, Boulder, Colo.

SEPTEMBER

5-8 American Chemical Society, Chicago section, eleventh national chemical exposition, International Amphitheatre, Chicago.

11-15 Instrument Society of America, fall instrument-automation conference and exhibit and sixteenth annual meeting, Biltmore Hotel and Memorial Sports Arena, Los Angeles.

12-13 American Gas Association, Southern Gas Association, annual accident prevention conference, Statler Hilton Hotel, Dallas.

13-15 Pacific Coast Gas Association, convention and annual meeting, Coronado Hotel, Coronado, Calif.

13-15 Mid-Continent Oil and Gas Association, Louisiana-Arkansas division, annual meeting, Roosevelt Hotel, New Orleans.

13-15 National Petroleum Association, annual meeting, Traymore Hotel, Atlantic City, N. J.

Reed Cobra bits are just one example of the outstanding economies made possible by Reed's continuing program of research and development. These bits are setting phenomenal records all over the oil country in both mud and air drilling. For example—

On a West Texas well, drilling with mud below 12,000 feet, four Reed Cobra bits drilled 2,289 feet in 404½ hours. On an offset well it took 37 tooth bits to drill 2,172 feet in 558 hours. On another West Texas well a Cobra bit set an air drilling record of 3,644 feet in 103 hours.

In Pennsylvania, drilling with air, it is routine for one Reed Cobra bit to complete the hole from surface casing to TD. In this area total footage per Cobra bit regularly exceeds 7,000 feet.

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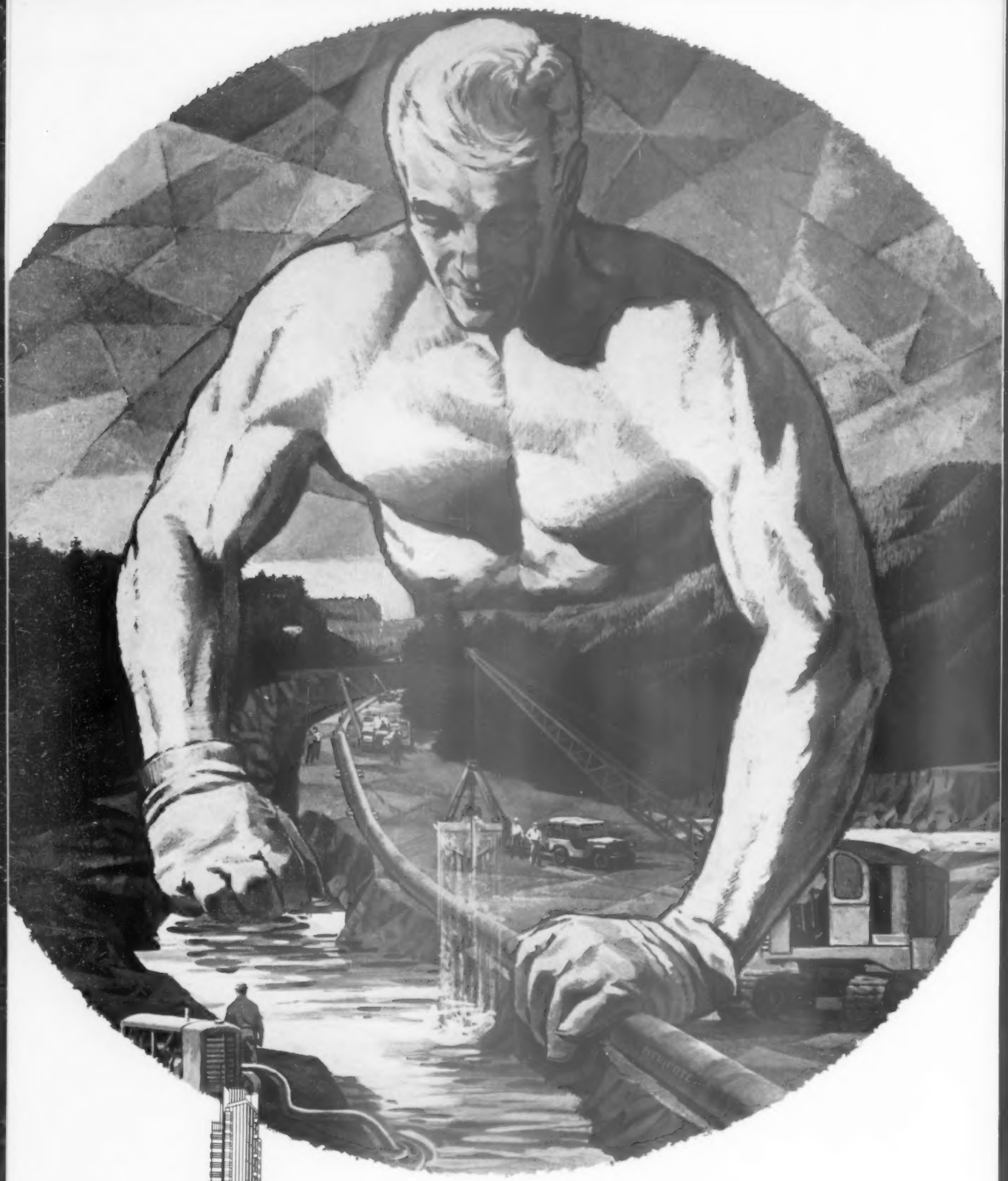

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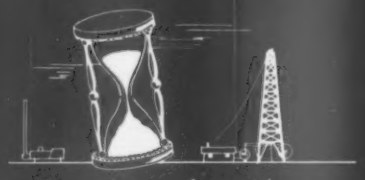

the Journal said...

50 years ago

April 20, 1911

The Royal Dutch Trading Co. and Shell Transportation Co. combine will establish offices in San Francisco as its first step in getting a foothold in the United States.

D. W. Franchot & Co. ships the first tank car of natural gasoline from its new plant at Kiefer, Okla., with satisfactory results. Special care had to be taken to handle this highly volatile product by railroad.

Oil fields of the country appear to be holding their own in production. In some instances they are adding to storage. Only 900,000 bbl. of oil, a negligible quantity, was taken from storage the past month in fields east of the Mississippi River. Texas and Louisiana held their own. Oklahoma added a little to storage. California and Mexico strengthened their reserves by 1,000,000 bbl.

25 years ago

April 16, 1936

Oklahoma's Gov. E. W. Marland calls out national guard to prevent interference by Oklahoma City government with drilling of oil wells on state's capitol grounds. Five wells already started. Adjoining property owners threaten to defy city ordinances against drilling in order to prevent drainage.

Texas Railroad Commission reports 60,067 producing oil wells in state. They include 23,583 flowing and 36,484 pumping wells. East Texas field leads with 17,774 flowing and 2,122 pumping wells. Producing area of the state totals 2,088,980 acres.

10 years ago

April 19, 1951

First production in Mississippi from the deep Smackover lime formation of Jurassic age is indicated as Union Producing Co. 1 Logan deep exploratory test in Tinsley field blows out while coring below 14,167 ft. Total depth is 137 ft. below top of the Smackover.

Major significance is attached to Sinclair Oil & Gas Co.'s new oil discovery (discovery well Northeast Woodward field) 7 miles northeast of Woodward, in Woodward County, Oklahoma. New well, 50 miles from nearest field (Ringwood), flows 10 bbl. of 44°-gravity oil per hour from Viola or Simpson dolomite at 9,679-9,715 ft. Discovery, first production in county, is called forerunner of new exploratory play across northwestern Oklahoma and Panhandle.

JOURNALLY SPEAKING

Full Many a Gem

WE ARE the imaginative, clear-visioned type of person who, if we had been there, would have said "It's a clever contraption, Orville, but it'll never get off the ground," or "It's a novel theory, Chris, but you'll never find India by sailing west."

So when we first heard about Project Mohole we just laughed and laughed.

The idea of drilling a hole through the bottom of the deepest part of the ocean from a ship floating free on the surface was fantastically funny.

In the first place it couldn't be done, and in the second place it couldn't do anybody any good even if it succeeded. It looked like a gigantic scientific boondoggle and a complete waste of time and money.

But we're beginning to pull in our horns. Maybe Mohole isn't so crazy after all.

In the first place it has been done. Five core holes have been drilled in the ocean bottom where the water was over 3,000 ft. deep, and tests are now being made in 12,000 ft. of water. It was accomplished by using a second-hand drilling barge fitted with king-sized outboard motors, a lot of know-how borrowed from the oil industry, and an array of specially invented gadgets and techniques that read like Jules Verne's science-fiction.

So now we haven't the slightest doubt that the Mohole engineers can design a rig that will spud in in 20,000 feet of water and drill another 20,000 or 30,000 ft. through the earth's crust, through the mysterious Mohorovicic discontinuity ("Moho") and right into the presumably molten core of the earth.

That will be literally deep as hell. The hell-bent drilling vessel ought to be named the "Charon," after the original boatman on the River Styx.

And what is the purpose of probing the Stygian depths? The Moholers admit that they are like the old lady in the antique shop—"nothing special, thanks; just looking." Mindful of the poet's injunction that full many a gem of purest ray serene the dark unfathomed caves of ocean bear, they are after any gems of scientific knowledge they can dredge up.

The fact is, this is purely to satisfy scientific curiosity. Nobody knows what's down there in Davey Jones's locker, so Mohole is going to get to the bottom of the problem. This is really research in depth—below the bottom and beyond. In one sense it may be the low point in exploration, but the expectation is that something of use to somebody is bound to be discovered.

We'll bet it will, too. These days science can take some odd scrap of information and adapt it to a dozen useful and unrelated applications. The point is that since the Moholers aren't looking for anything in particular and aren't trying to prove or disprove any preconceived notion, they are in the best possible position to find something of value.

This is the sort of research that should be used more widely in the oil business. The industry is doing a good job in researching its technical problems, but a pretty poor one on its economic, sociologic, and political problems.

Name any current problem—refinery runs, allowables, inventories, dealer margins, or what have you. Nearly everybody has a theory as to what's at the bottom of it, but there's been precious little digging below the surface. What's needed is some Mohole-type research in depth, aimed to go below the bottom and beyond, and conducted with a fresh approach and a completely open mind as to what results may be obtained.

If oil men would direct more of their scientific curiosity toward the mysteries of their economic Mohorovicic discontinuities, they might make discoveries as fascinating as those Project Mohole has already yielded.

Yo ho, Moho, here we come.

—Henry D. Ralph

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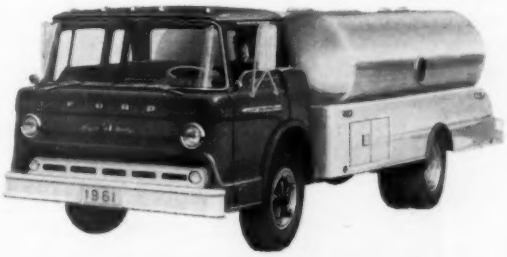
Tandem Axle models are available with tilt cabs. As with conventional tandems, aluminum walking beams, wheels, fuel tanks are offered to cut weight.



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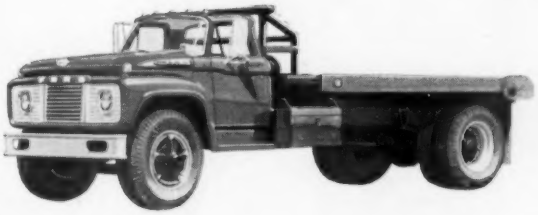

New huskier conventional trucks feature lighter, stronger frames of high-tensile steel . . . heavier gauge metal and stress-isolating independent mounting for radiator, fenders and cab.

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Tubingless Completions are becoming more numerous. Our own engineering and development programs continue as Baker keeps alert to the trends – ready to provide the practical and dependable new tools that will further improve tubingless completion methods and techniques.

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Recovery prescription: More of the 1960 dose

THE ANNUAL REPORTS of the larger oil companies this year tell a classic success story, a story with a moral.

The oil industry didn't exactly go from rags to riches within the year, but at this time last spring a good many people thought it was headed straight for the rag bag.

And while the industry isn't rich today, a majority of companies had 1960 earnings significantly higher than in 1959. The fact that oil did this while most other industries were undergoing a recession and showing poorer earnings was not due to happenstance.

OIL PERFORMED a do-it-yourself recovery project. Demand increased very little, and basic economic conditions in the industry didn't change. What improved was oil's management of itself.

A year ago oil was suffering all the ills of oversupply, excess capacity, languid markets, and weak prices. Earnings were off alarmingly. Investors said oil was a sick industry. Analytical observers said the trouble was poor management.

In midyear oil seemed suddenly to take hold of itself. Crude output was curtailed to the size of the market, refinery runs were slashed, inventories became less burdensome, marketing policies were revised. As a result, prices began to climb back toward profitable levels.

At the same time the industry began to reap some benefits from the drastic cost-cutting programs that necessity had forced on it. Most conspicuous was the reduction in work force, but there were many others. In short, the industry switched from fat and lazy to lean and hungry.

As usually happens with an individual, this self-discipline and sharp attention to business brought results during the last half of the year. The annual reports suggest that management is pretty pleased with itself and proud of its 1960 success.

NOW LOOK AT THE PRESENT. Again there are oversupply, burdensome inventories, sluggish markets, and weak prices.

There are signs that management may have relaxed its vigilance, like an individual who goes off his diet to reward himself for getting some initial results.

The basic problems of excess capacity, small demand increase, inventory control, and profitless marketing still remain. The easy and obvious cost-cutting methods have gone about as far as they can. Continued improvement requires continued tight operations and alert management.

The success achieved in the last half of 1960 should not generate false optimism that the industry can now rest on its oars. There is much hard pulling to be done before oil's recovery project is completed.

How well did oil really learn its lessons last year? As the soap operas put it, will success spoil oil management?

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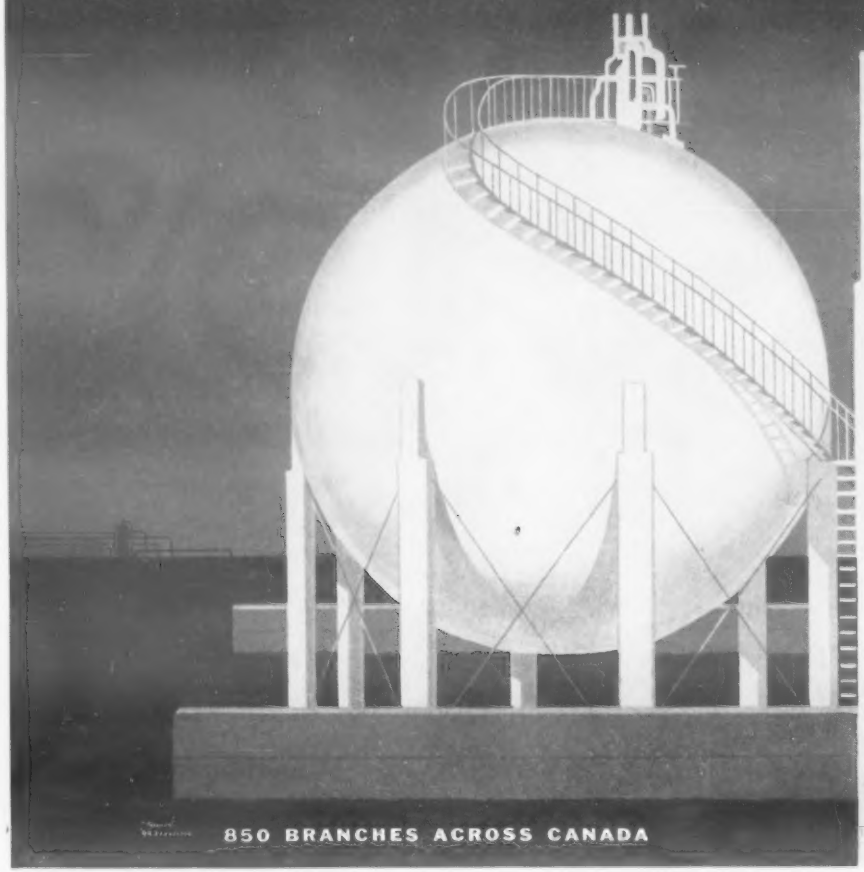

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RESOURCES EXCEED $3 BILLION

Antitrusters Will Take New Tack

Key men in antitrust matters and...

Robert F. Kennedy
Attorney General

Lee Loevinger
Antitrust Chief

Paul Rand Dixon
FTC Chairman

What Points They're Likely to Stress

THE TOP antitrust officials of the new administration are likely to put emphasis on these points:

- **Administered prices.** This will be an attempt to show that even in the absence of outright collusion, prices may be "rigged" by a few companies that are dominant in a given industry.
- **Whittling backlog of cases.** This is part of the administration's over-all effort to speed the work of regulatory agencies.
- **Broad investigations.** These would involve several companies within an industry rather than the singling out of one possible violator for investigation and possible prosecution.
- **Antimerger emphasis.** This would be directed especially toward the oil industry.

Look also for a tougher attitude on consent decrees, and for investigation of company compliance with past orders.

Clyde La Motte
Washington Editor

AN INDUSTRY man commented wearily not long ago: "There isn't much free enterprise left, and even where there is you find Uncle Sam running around acting like a cop."

Basically, he was talking about the Government's role in antitrust law enforcement.

No one in business underestimates the range of this role. No one doubts that it can be a powerful factor in company attitudes toward marketing practices, purchasing, and mergers.

In some cases the antitrust law is clear-cut. In others it isn't. That's why trends in the application of the law are always important.

And when a change of government "cops" occurs, it's helpful to know something about them—their ideas, their aims, and the pressures behind them.

After all, they are the men who will influence the trends for quite some time.

1. Broad patterns

Although business and industry usually shudder when Democrats take over at the Justice Department and the Federal Trade Commission, it must be remembered that some of the biggest antitrust clubs have been wielded by Republicans.

A recent example: Robert Bicks, antitrust chief under the Eisenhower administration, was considered "tough." He was especially hard on contemplated oil-company mergers.

Some antitrust experts feel that recent years have been rougher than usual because one party controlled the administration while the other controlled Congress.

As a result, congressional committees delighted in holding public hearings to "expose the laxity" of the administration in enforcing antitrust laws.

To prove this wasn't so, the enforcers were sometimes politically pushed into taking action when they didn't really have a sound case.

For instance, the Tulsa "conspiracy" case against 29 oil companies stemmed from a congressional hearing after crude-oil prices were increased.

Now, with the White House and

Congress under the control of one party, there is less chance the Justice Department and FTC will go off half-cocked just to demonstrate that they are on the job.

This does not mean antitrust work will be deemphasized. But it may mean that the antitrusters will be left more on their own to plot their own courses rather than following the lead of congressional committees.

So it looks as if the best clues to the direction antitrust enforcement will take under the "New Frontier" will come from the men who are moving into top antitrust roles.

2. New officials

When John F. Kennedy became President he was able, of course, to select a new attorney general and a new chief for the antitrust division of the Justice Department.

In addition—partly through chance—he was able to appoint two members of the FTC, including a new chairman.

With a vacancy due at the FTC this fall, he will be able to install a third member—giving him a majority on the five-man commission.

However, there won't be a revolutionary change in operations. There are laws, rules, and procedures which new officials cannot change. They will have to work in an established framework.

But they will be able to press their own views and direct their agencies into particular areas within the framework.

What can generally be expected from these key officials?

Robert F. Kennedy . . . The younger brother of the President is politically alert, and this may tend to shape his role as attorney general.

Because of his background in congressional - committee investigative work, it is considered likely that he will use a broad approach.

He is not likely to advocate new legal theories or to concern himself with the gray, uncertain areas of antitrust law. Instead, he will concentrate on the "hard-core" cases where the law is clear.

Note that he recently asked the FTC to check on company and industry compliance with past FTC orders and consent-decree settlements.

The attorney general obviously is on safe ground there, for those cases already have been decided. If the FTC can catch a company failing to abide by orders, it will have an easy case and can show the public that it is on the job.

Aside from looking for sitting ducks, Kennedy will be on the lookout for opportunities to attack so-called "administered prices." This would demonstrate a concern for consumers.

He would be particularly pleased to uncover evidence of agreements between any business and labor group to maintain artificially high prices.

Lee Loevinger, the new assistant attorney general in charge of antitrust work, seemingly has as one of his chief aims a change in the handling of consent degrees.

Some observers are convinced that consent-degree settlements will be fewer and harder to come by under the new regime at Justice.

They remember that Loevinger was labeled a "treble-damage" lawyer in private practice.

In price-discrimination cases, a company found guilty is liable to suit by those who were discriminated against. And the suits can be for triple the amount of damage the person or firm suffered because of the discrimination.

In consent settlements, however, such suits are less likely to succeed.

It is natural to assume that Loevinger, because of his background, will be reluctant to let a company "get off the hook" through consent settlements. At least he is expected to make the terms of consent settlements tough.

He has already said he thinks consent decrees should be made public before they are presented to a court for final adoption.

This, he feels, would give interested parties an opportunity to object to the terms if they felt they were unfair.

Antitrust attorneys say companies naturally will oppose such a move, since it would allow the Government to make changes in the terms even though an agreement had already been reached.

Also, they feel, it would expose the companies to "sniping" from anyone unhappy with the consent terms.

Paul Rand Dixon, the new FTC chairman, is one of several former FTC staff men who moved to congressional-committee staff work during the Eisenhower administration and are now returning to the FTC.

This indicates some likelihood of a return to the policies of the FTC in the pre-Eisenhower days.

Dixon told The Oil and Gas Journal that one of his immediate objectives is to "sell" his fellow commissioners on a plan to regroup the functions of the agency.

He also wants to make a few rule changes which he feels will enable the FTC to do a better, faster job.

One plan is to set a specific period for efforts to reach a consent-decree settlement in a particular case. This would be handled by the office of general counsel.

The current practice involves a hearing examiner. But under Dixon's plan, a case would go to a hearing examiner only after the consent approach had failed.

Dixon notes that about 80% of cases eventually are settled by consent decrees. He feels that his approach would free the examiners to concentrate on the "hard" cases.

The aim: To help speed the disposition of the tremendous backlog of cases at the agency.

Dixon thinks there is a great deal of wasted motion in present FTC procedures and the regrouping he has in mind will eliminate a lot of duplication of effort. This, too, would help accelerate the handling of cases.

Dixon also expects to try to develop sweeping cases involving widespread practices and then institute proceedings against as many companies as possible.

The purpose here is to avoid singling out one company for prosecution when several other companies in the same industry, including a firm's competitors, may continue doing the same thing.

This line of attack may even include advance notice by the commission that it is investigating certain practices in a certain area.

Dixon points out that such a move would let companies know exactly what practices the FTC considers illegal and thus would encourage them to discontinue such practices voluntarily without the need for legal action.

The new chairman also plans to revive a past FTC practice of making economic studies to help the commission evaluate the impact of certain industry or company practices.

3. Other influences

Any anticipation of antitrust trends must take Congress into consideration.

While sniping between congressmen and antitrust officials will be at a minimum, at least at the outset, there is little doubt that the influence of some congressmen will be felt.

It is generally understood that Dixon's appointment was strongly urged by Sen. Estes Kefauver (D.-Tenn.).

"Insiders" say Loevinger was the choice of Sen. Hubert Humphrey (D.-Minn.).

Rep. Wright Patman (D.-Tex.) and Rep. James Roosevelt (D.-Calif.) apparently pressed for the selection of Everett MacIntyre to fill the next vacancy at the FTC.

This does not mean that these congressmen will call the signals for the new antitrust officials. Obviously, however, the congressmen would have not sought the appointment of men whose antitrust views differed sharply from their own.

Kefauver, chairman of the Senate antitrust subcommittee, is not considered a friend of oil. At the committee's hearing on Loevinger's appointment, Kefauver brought up the subject of joint ventures by U. S. oil companies.

Patman has long made a specialty out of defending small business, while Roosevelt has spent a great deal of time investigating the "coercion" of independent service-station operators by major suppliers.

These factors, and others, do not add up to any full-scale attack by the new antitrust officials against the oil industry.

But they may mean that the new "cop" on the beat will be keeping a wary eye on oil activities.

Hearings on FPC Nominees Start in Low Key

NEITHER Joseph C. Swidler nor Howard Morgan, the two new appointees to the Federal Power Commission, offered any instant solutions to natural-gas-regulation problems when they appeared before a Senate committee last week.

Morgan did indicate an interest in a plan to exempt smaller producers from direct control, leaving the FPC free to concentrate on the big producers.

He appeared to favor utility-type regulation for the latter.

Swidler, the man President Kennedy wants as FPC chairman, was not questioned closely on this point during the opening phase of the hearings.

At the first hearing, Morgan was on the stand all morning. After a brief afternoon session in which Swidler was questioned, the committee recessed for an unspecified time.

The committee will decide this week when to resume hearings.

There was no other indication from the committee as to when it plans to act on the appointments. If it approves either or both men, the Senate as a whole will vote on the selections.

Expected opposition to the appointment of Swidler did not make itself evident on opening day.

Morgan's views . . . Morgan told the committee he felt it would be "extremely difficult" to extend the traditional utility-rate regulatory concept to all natural-gas producers.

"I would like to explore the possibility of classifying the producers who are large enough to influence the market and regulate them according to the Supreme Court ruling," Morgan said.

As for smaller producers, he said he would consider leaving them free from controls and letting competition regulate prices on gas from their wells.

Such an approach would lessen the administrative burden on the commission without hurting the gas consumer, Morgan said.

Later in the hearing, in reply to a question, Morgan emphasized he was not closing the door on the utility-type approach for all producers. But he said applying it to all creates an "extremely burdensome" problem for the commission because of cost variations and other factors applying to the many independent producers.

He said he had not made up his mind about the FPC's current effort to use an area-pricing approach. He did comment that there are aspects to this approach "that are disturbing to me."

He noted that the criticism has been made that area prices are already too high.

From the tone of questioning by committee members, it did not appear there will be any serious challenge to Senate confirmation of Morgan's appointment.

If seated, he will fill out the remainder of the term of the late John Hussey. This position has been held on a recess appointment since last summer by Paul A. Sweeney, who has now resigned. Morgan's term would expire June 22, 1963.

Swidler's views . . . In his brief appearance Swidler didn't get much chance to express his views on gas regulation.

He did say he would seek to enforce the laws as written and that he felt he could do so fairly, without prejudice or bias.

Swidler was asked if he subscribes to the regulatory views of James M. Landis, assistant to the President on regulatory agencies.

He replied that he had "suspended" judgment on some of these views, and that he felt he would need more background before reaching a definite conclusion.

Asked if he is a "public power" man, Swidler said flatly that he feels there is a need for both private and public power and that the existence of both tends to make each do its best.

Swidler, if confirmed, would fill a vacancy that occurred last June when the term of William R. Connole expired. Swidler's term would extend to June 22, 1965.

President Kennedy wanted to name Swidler chairman of the agency before Chairman Jerome K. Kuykendall's term expires in 1962. But apparently Kennedy won't press for this (see p. 81).

Petroleum Coking Grows Despite Excess

D. H. Stormont
Refining Editor

ONE OF the most widely used methods of reducing residual yields — coking — is not losing its popularity despite excess capacity which builds sizable piles of coke at some refineries.

In recent years the growth of coking capacity has outpaced the demand for coke in non-fuel uses. More and more coke has been burned as boiler fuel or exported. And there is little prospect of an early change in this picture.

However, coking frequently is still the most economical way to upgrade residual oils to distillate products. Thus more coking capacity will be added this year than in any other since 1956, even though the price outlook for by-product coke is poor.

Why the new capacity . . . After a 3-year lull, construction of new cokers was revived in 1959.

Units now under construction will increase daily coke capacity by about 1,400 tons to a new high of 18,250 tons.

Units announced for completion next year, plus several under consideration, would push 1962 capacity well past the 20,000-ton mark. Almost all of the new capacity will employ the delayed-coking process.

The revival in coker construction centers around the need for some refiners to further reduce their output of residual oil. A steady decrease in heavy-fuel-oil demand during the past 15 years, and the recent trend toward greater imports have reduced residual oil to the status of a by-product.

Compared with the price paid for the whole-crude charge stock, the refiner is selling his residual oil at a loss of approximately $1 per barrel. This disparity makes it attractive for some refiners to upgrade excess residual stocks into more valuable light products.

Where the coking route is followed, studies have shown that an attractive payout can be realized if as little as $5 per ton is received for the coke.

Naturally the price received affects a refinery's profit picture. Often, however, a zero value is placed on by-product coke in calculating the economics of planned units.

How petroleum-coke output is growing

	Net coke output, 1,000 tons*	Daily avg. output, tons	Approx. % plant capacity	Amt. exported 1,000 tons	Year-end stocks 1,000 tons
1955	3,237	9,000	90	903	305
1956	3,462	9,500	75	1,285	264
1957	3,858	10,600	73	1,045	507
1958	4,524	12,400	84	881	963
1959	4,694	12,900	83	936	1,141
1960	5,211	14,200	86	1,371	877

*Exclusive of coke laid down in catalytic cracking units, as reported by Bureau of Mines.

Where the coke's going . . . U. S. refinery coke production jumped from 3,237,000 tons in 1955 to 5,211,000 tons last year, according to the Bureau of Mines.

Domestic production for non-fuel uses increased to about 2,100,000 tons. Of the new production, almost 75% is either being burned as fuel or exported.

Most of the coke going into non-fuel uses is sold by the refiner on long-term contracts to companies which calcine the raw coke into a product for subsequent use as anodes, electrodes, and other carbon products.

Aluminum companies now calcine sizable portions of the coke they require. But substantially all other petroleum coke is calcined in the plants of five companies. Of these, Great Lakes Carbon Corp. plants account for about two-thirds of the calcining capacity.

Prices received by the refiner for green coke sold under contract vary according to sulfur content, plant location, and other factors. Where the product meets the 2%-or-less sulfur content preferred by aluminum manufacturers, the average price runs about $12 per ton. A refiner with a favorably located new plant reported a contract price of $15 per ton.

These prices apply to coke produced by the delayed process.

Fluid coke is an entirely different matter.

Because of its hardness, fluid coke does not calcine as satisfactorily as delayed coke. So most of it is burned as fuel.

Non-fuel uses . . . Only about 41% of the petroleum coke consumed last year in the U. S. went for industrial purposes.

The aluminum industry accounted for more than half of the industrial demand.

Coke is used in the form of carbon anodes in the electrolytic recovery of primary aluminum.

The anodes, composed of both calcined and green coke and a pitch binder, are consumed at the rate of about 65 lb. for 100 lb. of aluminum produced.

On a green-coke basis, about 55 to 60 lb. of coke are needed for 100 lb. of aluminum.

Last year, domestic aluminum output was slightly over 2 million short tons—almost 400,000 tons more than in 1955. That meant last year's output required the consumption of about 1,250,000 tons of green coke.

In producing this amount of aluminum, the industry was operating at about 80% of capacity. During February of this year it was operating at only about 69% of capacity in producing 138,560 tons. But for the entire year it is forecast that aluminum output will just about equal last year's record.

At the first of the year the industry's aluminum-producing capacity was placed at 2,468,750 tons annually. Addition of about 178,000 tons of capacity is expected during this year and in 1962.

. . . Canada's aluminum capacity has grown at an even faster rate, and is responsible for a big portion of

Capacity

the demand for U. S. coke exports.

Last year Canada's capacity reached 865,000 short tons, compared with 600,00 tons in 1959. Production in 1960 amounted to 745,000 tons, or a green-coke requirement of about 450,000 tons.

Total coking capacity of the five plants in Canadian refineries is 575 tons daily. Thus last year there was approximately a 250,000-ton coke deficit, all of which was supplied by imports from the U. S.

If both the U. S. and Canadian aluminum industries operate at full capacity—creating a green-coke requirement of 2 million tons annually—there is some question as to whether there would be enough low-sulfur coke to go around.

A large calcining company says there would be enough. An equally large refiner says there wouldn't.

Sulfur in coke . . . The trend toward greater use of high-sulfur crudes as charge stocks and the practice of using heavier fractions as coker feed, result in more and more concentration of sulfur in by-product coke.

Specifications for coke to be used in manufacturing aluminum are not too rigid. But manufacturers prefer a sulfur content of less than 2% and a vanadium content of less than 250 p.p.m.

Much of the delayed coke being produced does not meet these specifications.

However, through blending with other green coke of greater purity, some below-par coke ends up in anodes. This includes some fluid coke.

According to one calcining company spokesman, some aluminum companies have used as much as 5-10% fluid coke in their aluminum anodes. Price and location of the fluid coke sources are major considerations.

An indication that higher-sulfur-content cokes may ultimately be used is seen in the experience of a Hungarian aluminum producer.

Petroleum coke containing as much as 6% sulfur reportedly was successfully used for anodes, after first being calcined at about 1,500° F.

Other non-fuel uses . . . Coke is also used in making graphite electrodes, carbon abrasives, and carbide.

Statistics on how much petroleum coke goes into these uses are not exact. But it is estimated that last year 500,000-600,000 tons of coke were used for electrodes, 100,000 to 200,000 tons for carbide, and an additional 100,000 tons for silicon carbide.

Numerous other roles account for smaller quantities.

These include the use of coke for carbon brushes, dry-cell battery cores, structural carbon, and filter aids.

A more recent use is in the production of nuclear graphite.

This miscellaneous market, as well as others being developed by the large calcining companies, will expand. But a tremendous expansion would be necessary to make them important users of petroleum coke.

Fuel uses . . . The amount of coke burned as fuel reached 2 million tons last year, twice the 1955 figure. On a percentage basis, about 40% ended up as boiler fuel compared with 33% of the 1955 output.

Average price paid for delayed coke as a fuel now ranges from $5 to $6 per ton. Quantity and quality of the coke have a bearing on the price received — but the most important factor is its location with respect to markets.

Much of coke's recent gains as a fuel have resulted from across-the-fence deals between a coking company and a user.

At the Delaware City refinery of Tidewater Oil Co., about half of the output from a 1,200-ton per day fluid coker moves across the fence to a power plant operated by Delaware Power & Light Co. Tidewater in turn receives steam and electrical power from the utility.

In another deal, coke from American Oil Co.'s 700-ton delayed coker at its Yorktown, Va., refinery is used by the next-door power plant of Virginia Electric Power Co.

Similar arrangements have been made between calcining companies and oil companies for producing aluminum anode and metallurgical coke.

At Lake Charles, La., where Continental Oil Co. has a 325-ton delayed coker, coke is processed in a calciner jointly owned with National Carbon Co.

Standard Oil Co. (Ohio) and Pittsburgh Consolidation Coal Co. formed the jointly owned Mountaineer Carbon Co. and erected a 165,000 ton per year calcining plant at Cresap, W. Va.

Fluid coke lags behind delayed coke in finding markets, because it is harder to pulverize and contains less volatile material.

Tidewater is disposing of all coke from its Delaware fluid unit as fuel.

A sister unit in the company's Avon, Calif., refinery hasn't enjoyed such a ready market. But last year a new steam plant was added and this takes about 200 tons of the 1,200-ton daily output.

A huge pile which has accumulated at Avon during the past 4 years is also being reduced in another way. Recently shipments were started to Europe, reportedly at a delivered price of about $6 per ton.

More to export . . . Overall coke exports have been trending upward for the past 2 years and amounted to a record 1,371,000 tons last year.

Petroleum-coking capacity moves up

Year, as of Jan. 1	Charging Capacity (1,000 B/D)				Coking capacity, tons per stream day
	Delayed	Fluid	Batch	Total	
1955	243.8	3.8	35.3	282.9	8,092
1956	296.5	13.8	27.3	337.6	10,882
1957	304.7	105.8	43.9	454.4	14,392
1958	319.4	100.6	37.4	457.4	14,408
1959	324.1	100.8	31.6	455.5	14,600
1960	323.1	101.0	22.5	446.6	16,198
1961	321.6	97.3	17.3	436.2	16,903
1962*	357.6	97.3	17.3	472.2	18,250

*Estimated

Capacity of Top U. S. Coking Firms

	Tons Daily
American Oil	3,103
Mobil Oil	2,790
Tidewater Oil	2,400
Union Oil	1,220
Shell Oil	900
Continental	835
DX Sunray	700
Standard Oil Co. (Ohio)	640
Great Northern Oil	600
Skelly Oil	500

Besides the flow to Canada, large amounts were shipped to Europe for aluminum and fuel uses.

Japan also was a big importer of fuel coke.

Some fuel coke reportedly is being delivered to Europe at a $15-per-ton price.

The amount of coke going into export is partially influenced by available supplies in the U. S. and the availability of cheap transportation. Currently these factors make such movements favorable.

However, European refiners are becoming more interested in coking as a means of increasing middle-distillate yields.

A 350-ton delayed coker recently was completed at Hanover, Germany, and a 250-ton unit is under construction there. Several other units are in the planning stage.

All will affect the market for U. S. coke.

Future for coking . . . Although the outlook is not particularly bright for petroleum coke as a high-profit item, the role the process plays in the economics of refinery operation assures many more units will be built.

Two years ago Mekler and Brooks of Lummus Co. forecast that approximately 11,000 tons of new coke capacity would be built in the U. S. by 1965.

As reflected in recent API refinery reports, about 1 million bbl. of residual are being produced daily. Of this amount almost 300,000 bbl. is produced by California refineries, 180,000 by Indiana-Illinois-Kentucky plants, and about 160,000 bbl. each by East Coast and Gulf Coast refineries, API reports say.

The Gulf Coast residual output represents an 8% yield, one of the lowest of any area.

Completion this summer of a 20,000-bbl. delayed coker at Mobil Oil Co.'s Beaumont refinery and a 12,000-bbl. unit at Gulf Oil Corp.'s Port Arthur plant will further reduce the yield.

In addition, Humble Oil & Refining Co. may soon announce a large delayed coker for its Baton Rouge, La., refinery.

Ripest area for a substantial coker-construction program is the West Coast.

Residual yields there amount to about 25%.

Stocks currently are not excessive, but they would be if largely uneconomic shipments to the East Coast and Europe had not been made. Restrictions on fuel-oil burning in the Los Angeles Basin during 7 months of the year further complicate the situation.

Barge moved from Louisiana to Alaska to lay gas line

A BIG pipe-laying barge has started the second leg of a 6,874-mile tow from Morgan City, La., to Turnagain Arm south of Anchorage, Alaska.

The barge will be used to complete an 80-mile, 12-in. gas line from the Kenai unit gas field to Anchorage.

An attempt to cross Turnagain Arm failed last year, but the 240-ft. barge is expected to handle the job and have the 6-mile submarine section completed by early July. All portions of the line except the submarine section have been laid.

Twin 12-in. lines will be laid under the arm.

The barge, named the Tidelands, is owned by J. Ray McDermott & Co. It was towed from Morgan City to Seattle and was scheduled to leave Seattle over the week end for the tow to Alaska.

The line will be moving gas to Anchorage late this summer.

Alaska Pipeline Co. will own and operate the line. The gas will be supplied by a five-well field developed by Union Oil Co. and Ohio Oil Co.

Recovered

Hugh Pylant
Petrochemical and Gas Processing Editor

COMPETITION in the rough-and-tumble sulfur market is getting even tougher as sulfur from petroleum and natural gas, called "recovered sulfur," keeps pouring in.

A price squeeze began several years ago when Frasch mines in Mexico began operating on a large enough scale to compete with Frasch producers in the United States. Since then, export sulfur prices have fallen from $31 per long ton, f.o.b. vessel, to $25.

U. S. domestic prices also have been affected, but not as seriously. Prices have declined from $26.50 per long ton f.o.b. producing site, to $23.50.

Big output from recovered-sulfur facilities in Canada, France, and the U. S. has aggravated the surplus-supply problem. This factor is reflected in the downward trend of prices.

Large-scale production of recovered sulfur began in the mid-1940's in the U. S. For years, production has been shooting up in this country and throughout the world.

In the past half-century, sulfur consumption has been increasing at a uniform rate of 5% a year.

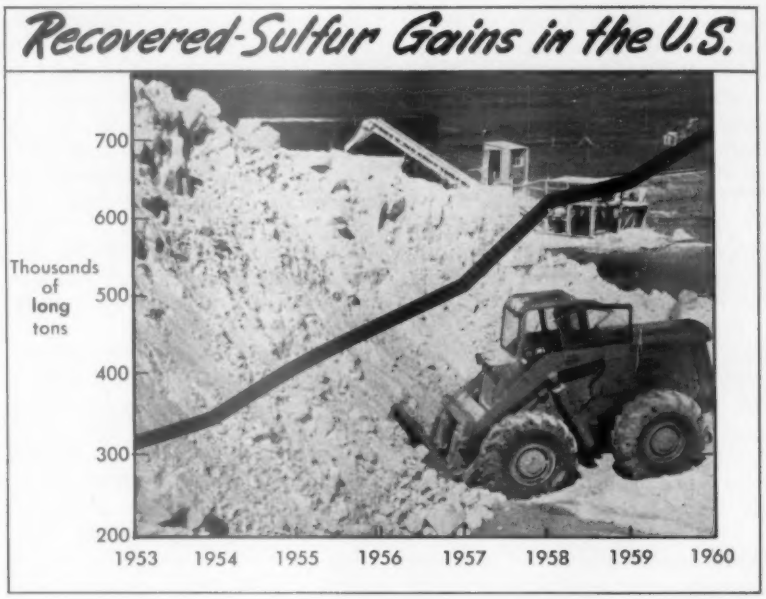
Once the market was supplied primarily from Frasch sulfur mines along the U. S. Gulf Coast. As demand increased, so did the output of these mines. But the success of recovered sulfur has made a dent in Frasch production.

Production and sales figures for the U. S. show that recovered sulfur is absorbing increases in market demand. Currently there are 65 sulfur-recovery plants in the U. S. with a total capacity of about 4,600 long tons per day. Others are planned.

Markets . . . About 80% of the sulfur consumed in the U. S. goes into the making of sulfuric acid. Ten per cent is used in pulp and paper mills, 8% goes into carbon disulfide manufacture, and the remainder is used in other ways.

Recovered sulfur is making its biggest impact on local markets. Since production facilities aren't

Sulfur's Impact on Market Is Growing



limited to one general area like Frasch mines, transportation costs are lower and consumers pay less for recovered sulfur.

Many recovered-sulfur producers feel that the hydrogen-sulfide (H_2S) they use must be removed from their petroleum or natural gas anyhow, so the only expense in sulfur production lies in operating and paying out the recovery facilities.

Under this assumption, they sometimes undercut the price of sulfur to avoid an inventory buildup.

Sulfur for 1960 totaled about 1.6 million long tons, and came primarily from Frasch mines. The export market and certain large accounts that recovered sulfur can't handle are about the only remaining major outlets for Frasch sulfur.

Even the export market isn't assured. The beginning of recovered-sulfur production at the Lacq field in France in 1957 was a big blow to sulfur exporters. This production has now reached some 1,000 long tons per day and supplies most of the European consumers who formerly depended on the U. S.

Inventory . . . In 1960, production of recovered sulfur in the U. S. hit 724,000 long tons. Sales, including exports, reached 755,000 long tons. Recovered-sulfur inventory for the year stood at 109,000 tons.

These figures compared with Frasch production of 4,943,000 long tons, Frasch sales of 5,084,000 long tons, and a Frasch inventory of 3,699,000 long tons.

It can be seen that the ratio of inventory of Frasch sulfur to production is fairly even, but for recovered sulfur the inventory is well below production.

Sulfur-industry people feel that the petroleum industry is deeply involved in the sulfur business and that it needs to be careful about price-cutting tactics or other poor marketing practices.

They also think recovered-sulfur producers need to consider stockpiling surplus production to avoid dumping the product on the market and bringing on a price depression.

Production costs . . . The cost of sulfur from Frasch mines is dependent on the type of sulfur deposit.

Size of the deposit, porosity, depth, and other characteristics enter the picture.

Using these variables, a factor can be worked out that will give the cost of sulfur in terms of gallons of hot water required per ton of sulfur produced. In computing the cost of preparing the hot water and of the pumping involved, it is usually found that Frasch-mined sulfur will vary in price from $9 to $13 per long ton, f.o.b. mine. This includes operating costs and depreciation, but not general sales and overhead costs.

As indicated previously, recovered-sulfur cost hinges partly on the value assigned to the hydrogen-sulfide raw material.

Assuming a reasonable cost is applied to the H_2S, and a separate labor force is required, the price of recovered sulfur will run about $8 to $12 per long ton, f.o.b. producing site.

But if it is assumed that the H_2S is a by-product of no value and that the sulfur facility—which usually is operated in conjunction with a refinery or gas-processing plant—is only charged with utilities, depreciation, and a small share of the labor, the cost of sulfur could be pegged at about $3 to $4 per long ton, f.o.b. recovery site.

These figures make it obvious that recovered sulfur usually has a definite cost advantage over Frasch sulfur — particularly in supplying local markets where no appreciable transportation costs are involved.

Canada . . . Recovered-sulfur production in Canada is still considered to be in its infancy. Canada now has underway, or is planning for completion by 1962, almost as much capacity as the amount in place. It is estimated that Canadian production of recovered sulfur will exceed 6,000 long tons per day during the next 5 years.

At present the nation has 14 sulfur-recovery plants with a total capacity of about 2,880 long tons per day. Another four plants are planned with an estimated sulfur-recovery capacity of 2,670 long tons per day.

Canadian consumption of sulfur exceeds production, but many of the sulfur producers must stockpile much of theirs because of market inaccessibility. The remoteness of these producing facilities drives transportation costs so high that imported Frasch sulfur is often cheaper.

Marketers Start Big '61 Motoring Season

W. A. Bachman
Marketing Editor

SURE signs of spring: Oil companies are putting new faces on their service stations with bright paint and shiny emblems.

Through flashy signs and advertisements, they are extolling the motoring pleasures and economy to be gained from improved gasolines.

All this activity across the country is the tipoff that the competition between now and Labor Day for the motorist's business may be the fiercest in the industry's history.

At least four big campaigns already are underway:

... **Pure** is in the midst of a 24-state campaign introducing its two new Firebird gasolines and plans the largest merchandising and advertising campaign in its history.

... **Indiana Standard,** with the aim of being a national marketer, is pushing its American brand name over the country while still retaining the Standard identification in its Midwest stronghold.

... **Phillips** is completing a new look program with fresh paint and new colors throughout the company and is driving hard into new territory on the eastern seaboard and in the Middle West.

... **Humble** is making the Enco brand familiar in a campaign that ultimately will make it a nationwide marketer.

Other marketers are approaching the big gasoline-selling season with improved products, with streamlined marketing organizations, new dealer training programs, and new promotion plans for credit cards, vacation travel, and local recreation centers.

Even the industry itself, through a new API Development Committee, is getting into the act. Oil and the automotive, rubber, and recreation industries have joined together to promote motoring.

Firebird flies . . . Pure officials report their new gasolines have received a good reception which has been translated into sales gains.

Pure's Firebird Premium and Firebird Regular replaced Pure Premium and Pure Pep a little over a month ago. It's too early to assess the full sales impact but Pure Retail Marketing Manager Floyd Bules says dealers have been pleased with early sales. And the entire Pure marketing organization is enthusiastic about the new gasolines.

The new gasolines, coupled with a selective service-station building program to enhance the company image, represent a real departure for Pure marketing.

Pure has been known in the industry as a sound and conservative marketer. The plan to put new zip into gasoline selling was made several years ago but painstaking research and testing of the new gasolines was done before they were put on the market in early March.

Pure Marketing Vice President Harry Moir explained the premium contains a new additive, called Tri-Tane, which cuts hazards of engine deposits, maintains engine power, and saves repair costs. It does not change the octane rating.

The Firebird Regular contains an anti-stall and carburetor-detergent additive.

Strong advertising support has been given the new gasolines in all media and will be continued through the season. Dealers have been supplied with a host of promotion tools—the usual pennants, pole signs, banners, pump emblems, window signs, and pocket-size pamphlets for customers.

Moir and Bules are convinced that Pure's research teams have given them an outstanding gasoline that the marketing department can talk about—and the Pure organization intends to do plenty of talking.

Bulk of Pure's merchandising and advertising campaigns will be localized with the emphasis on traffic building.

Other Pure marketing innovations: A new plastic credit card; a new tire using butyl rubber tread and nylon cord to provide better traction and eliminate tire squeal; expanded travel-service program at selected stations augmented by a central travel and routing service.

The All-American—A familiar name—Crown gasolines, long associated with Indiana Standard, will be missing in the marketplace.

American super-premium and American regular will take its place. Introducing and putting across this switch will be the big task this spring of American Oil Co., now the manufacturing and marketing subsidiary of Indiana Standard.

American has adopted the red-white-and-blue torch and oval sign and will make it known from coast-to-coast.

In 15 midwestern states of the Standard Oil Division of American Oil Co., the Standard name will appear in the Oval. In all other areas—the East, South, and West—the American name will be used.

American marketing executives have been holding regional meetings for weeks with jobbers and dealers explaining the spring campaign. All stations and equipment now conform with the company color scheme.

The company's credit cards have been made uniform in design with slight differences only in insignia and wording according to the marketing area in which they are issued.

The cards issued to motorists in all parts of the country are expected to funnel increasing business to the company's 29,000 service stations.

The entire product line has taken on the American name and packaging designs have been changed to conform. Employe uniforms also have been changed. The Atlas line of TBA items has been added throughout the company.

American will extend its improved gasolines into all areas this year. A More Miles Per Gallon carburetor-cleaning additive, called M_2PG, was introduced in the Midwest last year and contributed to the competitive advantage of Standard gasoline. Octane ratings also were improved.

The "As You Travel—Ask Us" service will be stepped up at American stations. Under this plan detailed information on travel conditions and recreation spots in the station's area are made available to motorists.

American also will continue the travel accident insurance program

Campaign

which proved attractive to customers. American credit-card holders can use their accounts to pay semi-annual premiums to an insurance carrier. Started in the Midwest, it will be made available to other areas.

A new look . . . Phillips Petroleum Co. hopes to reap the profits of a "New Look" program begun 2 years ago.

The program of repainting all Phillips marketing facilities — stations and equipment — is virtually completed. The company has built many "new look" stations which feature the winged canopy and drive-through work areas in the rear.

A new terminal at Baltimore and new key-stop, unattended products terminals inland will enable the company to expand its distribution and cut costs as well.

Phillips officials are pursuing a program of securing jobbers and dealers in the Mid-Atlantic states and Ohio which Phillips recently entered as an active marketer. The program has pushed Phillips' brand into 40 states.

Phillips also has just completed arrangements to honor Diners' Club credit cards for retail purchase of gasoline and other supplies and services at Phillips' stations.

The arrangements will be extended as soon as possible to nearly all of the 18,000 Phillips 66 stations and marina dealers. The Phillips deal brings the largest number of one-brand gasoline outlets under the Diners' Club program.

Another major marketer concerned with a "new look" of sorts is Jersey Standard's Humble which still has not settled on a national brand name for its products.

Enco, now being tried out in several areas, may win approval this year if it meets with customer acceptance. Enco is taken from Humble's slogan, "America's leading Energy Company."

Jersey Standard President Jack Rathbone says the company will stick with the old Esso name wherever possible domestically and will use it exclusively abroad.

Humble's big 1961 goal is to improve the quality of its dealer organization. Week-long, intensive schools for dealers and their key personnel are being stepped up.

Other trends . . . As the motoring season nears, other major petroleum marketers are preparing for the sales battle with:

. . . Improved gasolines.

Many companies have blended new additives or stepped up the octanes slightly in their gasolines within the past year and will be wringing all the sales value possible out of the improved product.

Those counting on upgraded gasoline include Ohio Standard, Gulf, Atlantic Refining, Sun, California Standard, Richfield, and Tidewater.

The additives perform a variety of valuable functions, such as preventing carburetor icing, halting stalling, cutting down pre-ignition and spark-plug fouling, keeping carburetors cleaner, cutting down on engine deposits, or just burning cleaner.

. . . Management reorganizations.

There has been a series of efficiency moves among several marketers to streamline or decentralize their organizations.

Skelly has a major reorganizatoin and decentralization program underway.

Cities Service has consolidated the marketing activities of four domestic subsidiaries into a single

Shea Says:

Power-Packed Claims Are Weak

THE gasoline-advertising additive race has the buying public laughing at preposterous oil-company claims.

That's the way J. M. Shea, Jr., marketing vice president of American Petrofina, Inc., Dallas, characterizes the current competition of oil retailers to win the motorist's favor.

Shea told the Oklahoma Oil Jobbers Association that the addition of additives to additives has become ridiculous.

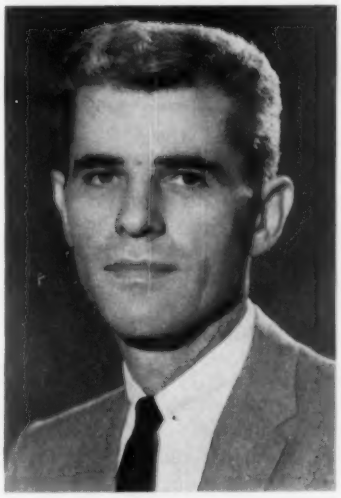
He observed that "the last additive the customer cared very much about came on the scene 30 years ago—clean rest rooms."

The only thing now left, he said, is to add colored air to automobile tires.

Shea declared the result of gasoline advertising is to make it increasingly hard for the station operator to live up to unrealistic assurances of perfection.

"No other type of retail business renders the long list of free services offered by the service-station operator," Shea pointed out.

"And no amount of power-packed, highest-octane, triple-additive claims is ever going to make the customer believe that a tank full of gas is as much fun as a bottle of bourbon, or even a bottle of milk."



J. M. Shea, Jr.

The American Petrofina executive said he does not foresee the time when people will be anxious to visit service stations.

As a result, his approach to advertising would be: Tell the public that dealer service is unexcelled, credit terms are equal to any, products are well ahead of the equipment in which they are used, are taxed higher than they should be, and are sold by people who have payrolls to meet and problems like everyone else.

company, Cities Service Oil Co.

Union Oil Co. of California has simplified its marketing operations in a reorganization which integrated terminal and transportation facilities into marketing.

Sun has consolidated two sales districts and improved its distribution efficiency with larger capacity pipelines and pumps at bulk plants and new control centers to reduce truck-loading time.

Apco will operate and expand the refining and marketing divisions of Anderson-Prichard in a new company formed after the exploration and production assets of Anderson-Prichard were purchased by Union Texas Natural Gas Corp. and Frankfort Oil division of Joseph E. Seagrams & Sons.

The Republic Division of Plymouth Oil Co. is studying the possibilities of entering retail marketing in eight southeastern states.

Oklahoma Boasts Deepest Dual Completion

THE WORLD'S DEEPEST dual completion is now producing gas condensate for British-American Oil Co.

The well, No. 1 Sally Krieger, is in the Knox field, Grady County, Oklahoma.

When the well was drilled to a total depth of 17,484 ft. in September 1957, the Arbuckle was penetrated. Gas condensate was found in the overlying Oil Creek and Bromide formations.

After testing the Oil Creek for 30 days, the well was plugged back to the Bromide. The Oil Creek production established this well as Oklahoma's deepest producer at the time. Later, the title was relinquished. The well was completed in the Bromide in December 1957.

A workover rig was moved onto the location in December 1960, the plug was drilled, and the well was put on production as a dual completion.

This restored the title of Oklahoma's deepest producer to the well, and added a new one—world's deepest dual completion.

The Oil Creek is producing through perforated intervals at from 16,490 to 16,612 ft. The Bromide is perforated between 14,805 and 15,288 ft.

Both zones are producing through 2⅜-in., plastic-coated P-105 tubing. They have about the same potential—12,000 M.c.f. per day, but the Oil Creek yields only 13 bbl. of condensate per million cubic feet while the Bromide yields 132 bbl.

New Pricing Plan Urged to End Gasoline Wars

NEW THINKING and a basic overhaul of pricing practices was advocated in Dallas last week as the answer to a current gasoline-marketing situation that constitutes "an industry disgrace."

R. B. Thomas, senior vice president in charge of marketing operations for Champlin Oil & Refining Co., Fort Worth, expressed these views at the annual meeting of the Texas Oil Jobbers Association.

Thomas criticized majors and independents alike for persisting in practices which breed continuing price wars with "accompanying temporary allowances, jobber competitive price adjustments, shrinking margins for dealers, jobbers, and refiners, so-called 'moonlight' deliveries of 'protected' gasoline, and so on to seemingly ever-worsening conditions."

He said independents are flushed with favorable public response to their lower prices, and are convinced they were entitled to post such lower prices. They have let predatory instincts overcome what should have been better long-run judgment, Thomas declared.

In his opinion the majors, unwilling to watch their business volume drain away, have become overly obsessed with "schemes to lower prices."

Phillips plan applauded . . . Recently announced area-pricing plans of the majors—"with one exception"—won't change anything, Thomas said.

Though he didn't mention the name of the lone exception, the Champlin executive obviously was referring to Phillips Petroleum Co.'s abandonment of guaranteed price margins to its jobbers and dealers.

Basic new plan offered . . . The price differential between gasoline sold by independents and by majors at both retail and wholesale levels, Thomas said, is narrowing whether independents like it or not. And the latter would be wise to face up to it.

The only solution Thomas can see for improving "shrinking margins resulting from this trend," is for independent refiners, jobbers, dealers, and private-brand marketers to support in their retail pricing the normal or established dealer tank-wagon prices set by the majors in each market.

Thomas offered a pricing system starting in any area with the competitive price existing at the unbranded-jobber level.

Branded jobber and dealer prices would move in response to price moves at the unbranded-jobber level.

"Branded jobber prices should vary from ¼-cent above the unbranded level for independents with lower-cost programs for their jobber customers to perhaps as much as ¾-cent a gallon for independents and majors with more extensive and costly programs.

"Dealer prices would be based upon and again be responsive to branded jobber prices. Today I think it would be realistic to base dealer prices about 3¼ cents a gallon above branded jobber prices."

Thomas would move this price to the dealer up to perhaps 3½ cents if rental charges to dealers were eliminated as he advocates.

No protected margins . . . "Most important of all," Thomas said, "remember that no provision would be made for protected margins, temporary allowances, or prices at either the dealer or the jobber level."

"WE CAN MOVE MIGHTY CHEAP DIRT WITH A D7D"

HARVEY W. JONES, JONES CONSTRUCTION CO., NATCHEZ, MISS.

This is one of two Cat D7 Series D Tractors used by the Jones Construction Co. for site preparation and general construction work. Commenting on their ability to move cheap dirt, Mr. Jones said: "The D7D is the right size tractor for our oil field and other contracting work. It's large enough to do the job—and small enough to be easily transported. We're well pleased with the trouble-free operation the past year. A D7D can't be beat!"

How about you—are you moving dirt as cheaply as you can? An older model tractor that is paid for may seem to move dirt at low cost. But in reality it could be losing as much as it earns. It just can't move earth as cheaply as a new machine. Why?

The D7D, for example, is more powerful and easier to maintain than predecessor models. Its ability to do more work and do it for less cost could greatly increase your profit potential. You can check this by comparing the production and costs of your present equipment with the D7D. For the full story and a demonstration with measurable results, see your Caterpillar Dealer. He has some eye-opening facts. He'll lay them on the line for you!

Caterpillar Tractor Co., General Offices, Peoria, Ill., U.S.A.

CATERPILLAR

Caterpillar and Cat are Registered Trademarks of Caterpillar Tractor Co.

INCREASE YOUR EARNINGS WITH A D7D

D7D MONEY-EARNING FEATURES

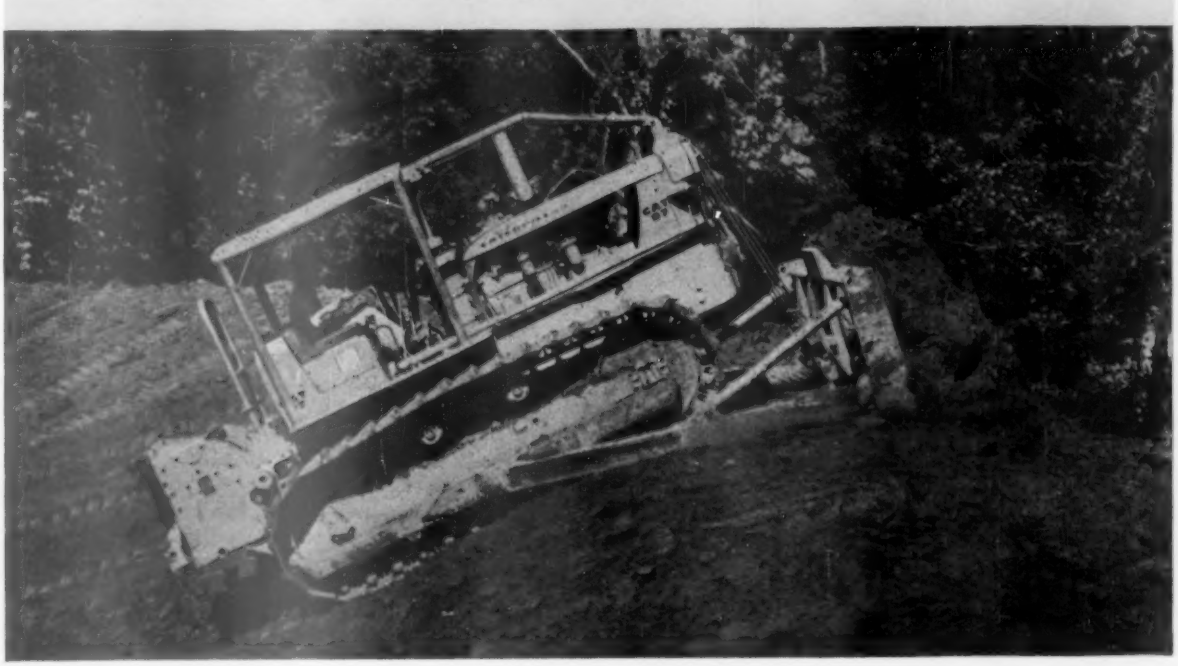
TURBOCHARGER—offered only on the D7D in its class. Addition of this unit has boosted HP to 140 at the flywheel, almost doubles lugging ability, delivers more efficient combustion for important fuel savings.

DRY-TYPE AIR CLEANER—removes at least 99.8% of dirt from engine intake air under all conditions. Materially lengthens engine life by protecting it from abrasive dust. Can be serviced in five minutes.

POWER TRAIN—stronger and better than ever, with final drive gear teeth strengthened 50%. Another factor increasing drive train life: an improved lubrication system for transmission, bevel gear and pinion.

ROLLERS—no more costly down time from improper or missed lubrication. Exclusive floating ring seals keep constant pressure on seal surfaces—oil stays in, dirt out. These rollers never need attention until rebuild time.

OIL CLUTCH—another exclusive in the D7D class. Users report up to 2000 hours of adjustment-free service on even the most severe applications. Clutch replacement almost unheard of!



Refinery Computers Lauded

. . . in report to WPRA. American Oil says its control program indicates returns will more than pay costs.

AMERICAN OIL CO., which has been evaluating computer control of refinery units for 3 years, expects to harvest a good return from its development efforts.

As American's program stands today, a 140,000-bbl. crude unit is under open-loop control at its Whiting plant. The ultimate goal of closed-loop control soon will be realized.

Design and installation of a computer system on a catalytic reformer at Whiting is well advanced.

And computer-feasibility studies probably will be carried out shortly on new alkylation units at Whiting and at Texas City.

In a paper read at the Western Petroleum Refiners Association's annual meeting in San Antonio last week, H. M. Hart of American said enough short-term benefits can be seen to offset the investment—ranging between $250.000 and $500,000 — allotted to long-range returns that will more than pay back development costs, which parallel this investment.

A realistic look at the feasibility of computer control based on this program, which was jointly carried out with International Business Machines Corp., leads to these conclusions:

. . . Economic incentives resulting from improved yields appear to be ample. In large units a very small shift in yield can justify the whole project.

. . . Capacity gains seem the second best source of economic return. However, studies confirm that a capacity gain of only about 5% is the most which should be credited to computer control.

. . . Labor savings are minor. Eventually the abilities of computer control to both monitor and alarm may permit pooling of operators for roving assignments on adjacent units.

. . . Conventional instruments are satisfactory so long as they have repeatability.

Present and future process-stream analyzers appear so promising as aids to sharp process control that they alone should be considered before any investment is made in computer control.

Catalytic cracking . . . American so far has not been able to justify computer control of fluid catalytic cracking.

A good market for middle distillates causes a marked seasonal shift in cracking load, limiting the incentive for incremental capacity or higher conversion to only a few months per year.

However, automating one catalytic cracking unit for precise monitoring of yields of gasoline and light ends would aid studies of reaction variables, Hart declared.

He added that he doubted American cat crackers were being operated at optimum levels at all times.

Such studies of reaction variables and their effect on yields will be a vital initial phase of most appilcations to catalytic processes, Hart said.

"Better yields through newly acquired knowledge, and through closer monitoring and control, are the best hope for really handsome payoffs.

"Much of the new knowledge gained from one such installation can probably be applied widely to sister units without computers. Thus second and third installations for given processes will be much harder to justify."

As to closed-loop control, Hart views it a little differently from open-loop.

If the system is adequate for open-loop control, it should serve for closed-loop control.

In some cases, closed-loop may be justified to keep operators from overriding computer recommendations with their own judgments. Likewise, it may help instill the need for good maintenance of all plant instruments as well as the special-control equipment.

Co-authors with Hart were R. T. O'Neil and J. C. Rhodes, both with American at Whiting.

Hydrocracking Gives Process

HYDROGEN from present catalytic reforming operations can support a nominal amount of hydrocracking after being used for hydrotreating.

Even without this help, hydrocracking can give a great deal of flexibility with regard to gasoline-to-middle distillate ratio.

Studies show that the payout of hydrocracking facilities which depend on reformer hydrogen is not as attractive as the payout gained by generating hydrogen through current processes.

These conclusions are revealed in a paper by M. J. Sterba, G. F. Asselin, and R. A. Lengemann of Universal Oil Products Co. The paper was presented at the Western Petroleum Refiners Association's annual meeting in San Antonio last week.

The present use of cat-reformer hydrogen in the U. S. is about 29% of the amount available, the authors reported.

They said hydrogen conservation can be divided into three eras.

In the first era, there was little concern about hydrogen. This attitude lasted until cat reforming was introduced into refineries.

The second era—the one most refiners are in now—finds plants using hydrogen as a reagent in many ways.

The third era will require more hydrogen than cat reforming can provide.

Present hydrogen-using processes include purification, petrochemical manufacture, saturation of olefin-containing fuels, and saturation of aromatics.

In discussing the nominal amount of hydrocracking permitted with cat-reformer hydrogen available after hydrotreating, the authors pointed out that supplemental hydrogen from refinery hydrocarbon streams is required for more extensive hydrocracking.

Other highlights of the paper:

UOP assumes that the U. S. heat-

Merger of WPRA, NPA Expected by Mid-1961

MERGING of the Western Petroleum Refiners Association and the National Petroleum Association into a new National Petroleum Refiners Association probably will be accomplished by mid-year.

WPRA's board of directors voted 36-0 for the merger at the annual meeting in San Antonio last week. NPA directors will vote on the proposal this week at Cleveland.

Since two of the five members of NPA's executive board already have voted for the merger as board members of WPRA, approval by NPA is almost certain.

Membership of both associations will vote by mail on the merger and on the new bylaws and articles of association. This action and the necessary legal steps should be completed by July 1.

Pending the merger, W. J. Carthaus, Great Northern Oil Co., was reelected president of WPRA. S. D. Breitweiser of DX Sunray Oil Co. was elected a new vice president.

W. J. Carthaus
. . . reelected WPRA president.

When the merger becomes effective, Paul D. Williams, WPRA secretary - treasurer, will head the Tulsa office.

D. C. O'Hara, Washington counsel for both associations, will head a Washington office of equal stature.

Neither Carthaus nor Rex Blazer of Allied Oil Co., NPA president, will serve as officers of NPRA.

Carthaus, in announcing the action at San Antonio, said studies in the past year have shown the merger to be in the best interests of both groups.

Since there is little duplication of services by the groups, no serious changes will stem from the merger. Activities of WPRA have been largely along technical lines, while those of NPA have been more in the legal field and in Washington activities.

Of the 78 companies holding membership in WPRA and the 50 companies in NPA, duplication of membership is confined to 22 larger companies.

It is expected that a meeting of the new NPRA will be held in San Antonio next spring and a fall meeting will be held in Atlantic City, N. J.

Flexibility and Steps Up Quality of Products

ing-and-residual-oil market will continue to soften in relation to motor fuels. It assumes further refiners will want flexible processes that can take advantage of temporary changes in the relative strength of the gasoline and heating-oil markets.

Hydrocracking, which also is ideal for the European market, can convert heavy stocks to heating oils with minimum gasoline make.

Hydrocracking also increases quality. A hydrocracking refinery will make gasoline which is lower in olefin and sulfur content and heating oils which generally are lower in sulfur and cycle-oil content.

UOP examined a number of cases of hydrocracking usage based on hydrogen from both cat-reformer operations and supplemental hydrogen. The more attractive uses are those which produce the greater gasoline-pool yield.

UOP found that payout rate improves as more gasoline and less heating oils are produced.

Isocracking test . . . Another paper read at the meeting reported on successful commercial application of hydrocracking to heavy catalytic cycle oil and heavy straightrun gas oil.

This has been demonstrated by recent operations at the 1,000-bbl. isocracker of Standard Oil Co. of California at its Richmond, Calif., plant.

Using a 24.5-gravity 500°-855° F. cycle oil from a nearby fluid cat cracker, a 29% yield of light gasoline (pentanes below 180° F.) was obtained, along with a 60% yield of heavy isocrackate (180°-350° F.).

A significant feature of this commercial-scale operation was the 29%-volume yield of −112° F. freeze-point kerosine jet fuel. Higher yields of the fuel could be made at the expense of gasoline production, J. A. Robbers of Cal Research said.

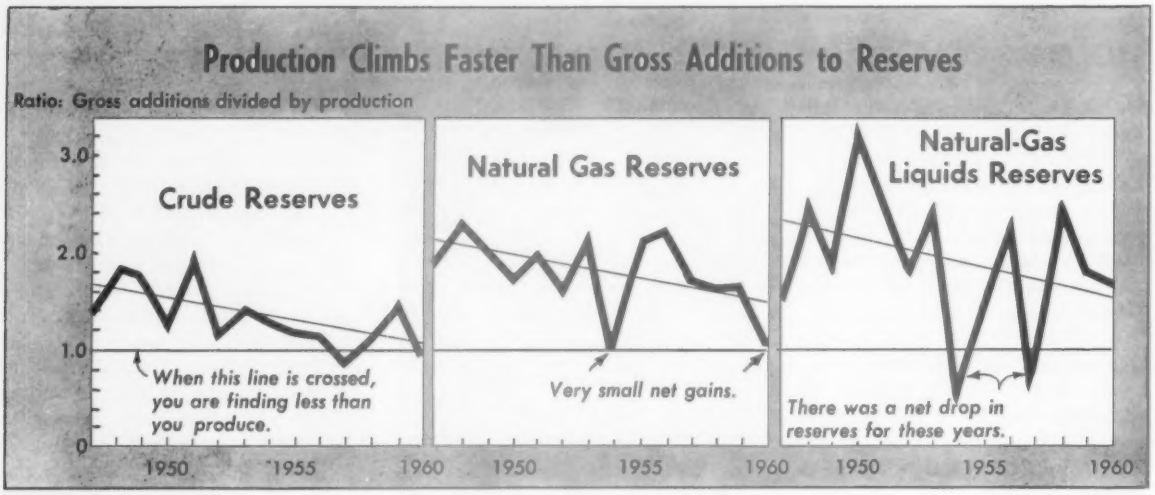
Hydrogen consumption using this feed stock amounted to 2,410 cu. ft. per barrel of raw feed. Of this amount 970 cu. ft. went for the hydrodesulfurization phase and 1,440 cu. ft. for hydrocracking.

Substantial reductions in investments and operating costs have resulted from detailed design studies, Robbers said.

These studies show that isocracking is even more attractive than cat cracking for converting middle distillates.

Payout for a 7,000-bbl. isocracker, after taxes, was given at 2.6 years—compared with 3.3 years when similar studies were made a year ago. Comparable payout for catalytic cracking was given at 5.8 to 7.4 years.

Co-authors with Robbers in this paper were M. J. Paterson of Cal Research and W. T. Lane of Standard of California.



Trends Favor Upturn in Exploration

- Present direction for ratio of production to reserves is tipoff that U. S. must find more oil soon either by drilling or by new recovery techniques.

THE TIME isn't far off when the discovery of more oil and gas will again become a major problem of oil-company management.

The charts above show that oversupply is a short-range problem. The industry trend in crude, gas, and gas-liquids is a greater ratio of production to addition to reserves.

If these trends continue, the logical conclusions are:

... **Crude** annual production will exceed additions to reserves in a very few years.

... **Natural-gas** production will start exceeding annual additions to reserves within a decade.

... **Natural-gas liquids** production will do the same a little later but also probably within a decade.

The trends could change only if demand for the fuels drops—an unlikely possibility—or if the rate of additions to reserves is stepped up by new exploration or increased secondary-recovery efforts.

In the chart for crude, the heavy line represents total gross additions to crude reserves each year divided by production during the year.

Take 1953 as an example. Gross additions totaled 3,296,100,000 bbl. of crude. Production amounted to 2,311,900,000 bbl. Gross additions divided by total production gives a ratio of 1.425. Thus operators added about 1.4 times as much oil to reserves as they produced. All points on the line represent this type of annual relationship.

Last year was the second year since the end of World War II when the ratio dropped below 1, meaning operators found less oil than they produced and had to draw upon reserves.

But the general postwar trend is the important aspect. Note that the trend line has a definite downward slope.

In the chart for natural gas, the negative slope of the trend line is not as steep as the one for crude.

Gross additions to reserves have exceeded production each year since the end of World War II, but there have been 2 years with very small net gains. Both of these years have been in the last half of the period. Although additions have been as much as twice production in 6 of the postwar years, there has not been a ratio above 1.8 since 1956.

The day of reckoning for gas is farther down the road than for crude, but the sharp production increases in recent years point to a sharper down slope in the trend line for the 1960's.

The picture for gas liquids combines good additions to gross reserves in line with discoveries of new natural gas and increased production to meet consumer demands for liquid fuels.

Wildcat Spudded in Alaska

A THIRD wildcat was spudded last week on acreage held by three companies in the Katalla-Yakataga area along the southern coast of Alaska.

The 1 Duktoth River in Sec. 24-20s-15 is east of two dry holes drilled on the 1,060,000-acre block held by the companies.

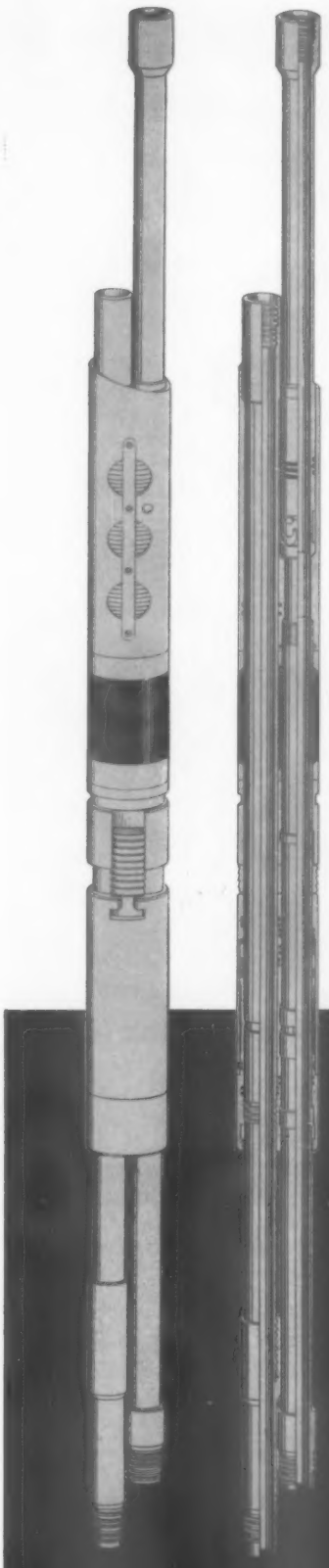
Most recent dry hole is the 2 Kaliakh, which was abandoned at 12,135 ft.

A projected depth for the new well has not been released, but it is expected to be a deep hole like the two previous wells.

Richfield Oil Corp. is operator on the block. Partners in the venture are BP Exploration Co. (Alaska), Inc., and Sinclair Oil & Gas Co.

Richfield owns 50% of the operations and the two partners each hold 25%.

Coastal Drilling Co., Bakersfield, Calif., is contractor on the well.



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Kennedy Asks Major Changes in FPC

- President follows Landis' recommendations except for naming an overseer. He would add two members, exempt small producers and pipelines to speed up case handling, and make chairman a presidential appointment.

IT'S OFFICIAL now: The Kennedy administration wants to exempt small natural-gas producers and certain types of pipeline activities from federal regulation.

President Kennedy sent a message to Congress last week on regulatory agencies generally, singling out the Federal Power Commission for particular attention because of the staggering backlog of cases there.

The President's action will undoubtedly make natural-gas regulation a live issue in Congress now, adding particular momentum to legislation already introduced that covers some, if not all, of the White House requests.

In his action last week, the President urged legislation which would:

. . . **Authorize FPC** to exempt independent producers who sell less than 2 billion cubic feet of gas annually.

. . . **Authorize FPC** to exempt pipeline applications "which seek merely to enlarge, extend, or replace existing facilities for the benefit of existing customers, only when it is assured that its action will not impair the preservation of reserves necessary to supply those consumers or permit the indiscriminate invasion of one supplier's territory by another."

. . . **Add two commissioners** to permit establishment of panels to handle gas and electric matters separately.

. . . **Specify that** the FPC chairman would be appointed by the President and would serve "at the will of the President."

. . . **Require pipeline** companies to put rate increases into escrow pending FPC disposition of a rate-hike request.

Landis influence . . . The thinking of James M. Landis, the President's chief adviser on regulatory problems, was strongly evident in the President's message.

The major points of the message coincided closely with the views expressed by Landis in an exclusive interview with The Oil and Gas Journal a few weeks ago (OGJ, Mar. 27, p. 55).

The chief exception was that the President did not call for an "overseer" to help keep him informed on problems developing in regulatory agencies. It is understood that the White House backed away from this because many congressmen had expressed the fear that the President was trying to set up a regulatory "czar."

Nor did the President comment on how the nonexempt producers would be regulated in the future. Landis had made no specific proposal here either, except to say that a definite formula for large producer regulation should be developed so that the cases could be handled with dispatch.

Strings attached . . . It should be noted that the President did not ask for legislation to exempt directly the small producers and routine pipeline activities.

Rather, he seeks that power for the FPC itself to make the exemptions. The reason: This would enable the commission to withdraw or adjust such exemptions should abuses, inequities, or "runaway" prices result.

In spelling out why he specifically urged action on FPC structure and procedures, the President noted that the small producers supply only about 10% of the natural-gas production but constitute about 90% of the cases before the commission.

He estimated that if they were exempt, the commission would then have to deal with only 270 producers instead of thousands.

On pipelines, he said a speedup in handling permits would free construction projects involving hundreds of millions of dollars.

The President also recommended upgrading of hearing examiners, particularly in such major agencies as FPC. The purpose, he said, would be to improve both their stature and their general level of competence.

General proposals . . . In speaking of regulatory agency needs generally, the President proposed more individual responsibility for individual commissioners and more delegation of authority to examiners, panels, and other groups to handle minor problems so that the time of the commissioners would be saved for important problems and policy decisions.

The President will send more specific proposals on the various agencies to Congress soon.

Kuykendall to Continue as FPC Chairman

IT APPEARS certain now that Jerome K. Kuykendall will remain as chairman of the Federal Power Commission for the time being—even if the Senate confirms the appointment of Joseph C. Swidler.

There has been a question as to whether the President could require Kuykendall—whose term on the commission runs until June 1962—to step down to make room for a new chairman now.

Apparently the White House has not decided to make a test of this. Rather, President Kennedy has now asked Congress for legislation which would give him authority to name a chairman at will. Should such legislation pass, the President could remove Kuykendall and name Swidler.

Another tipoff is that although President Kennedy originally announced the selection of Swidler to be chairman, when Swidler's name was sent to the Senate it was merely for confirmation as a member of the commission.

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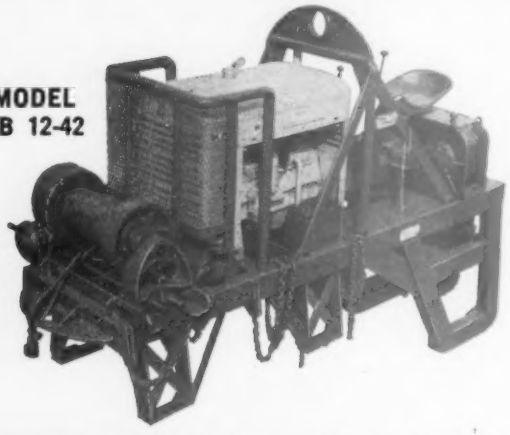

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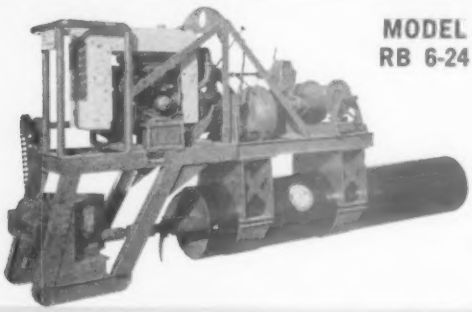

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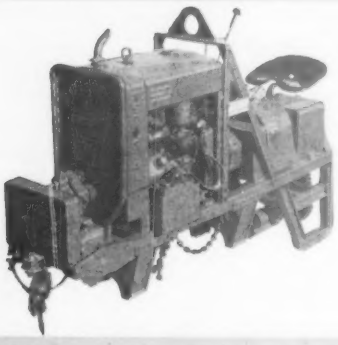

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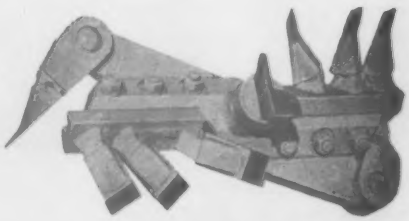

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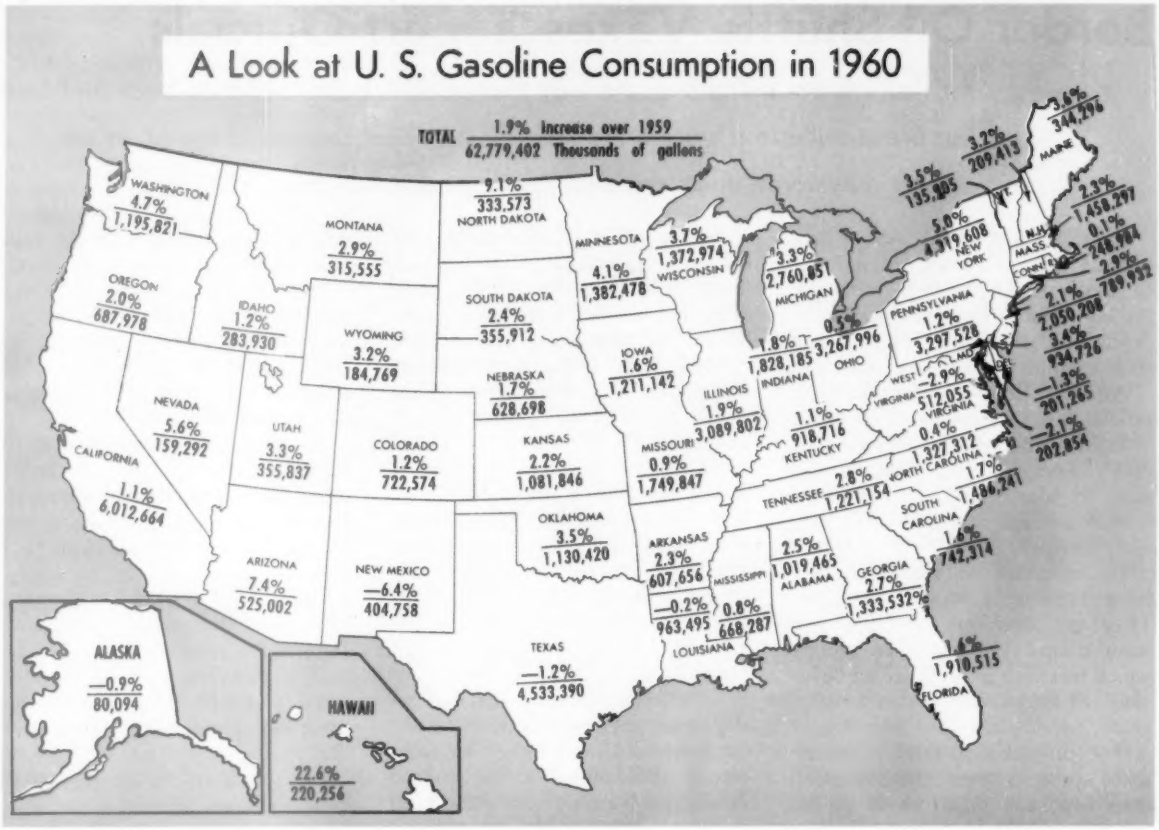


Gasoline-Consumption Gain Hits Postwar Low

THE ANNUAL GAIN in U. S. gasoline consumption reached a postwar low last year.

Consumption in 1960 as reported by the American Petroleum Institute amounted to 62.8 billion gallons, an increase of 1.2 billion gallons, or 1.9%.

It was the slimmest gain since the end of World War II on both a percentage and a volume basis.

The 1960 figure compares with the 1956-60 average gain of 1.7 billion gallons and the 1947-55 average gain of 2.7 billion gallons per year.

Figures were compiled by API from data supplied by departments of the various state governments, based on returns in accordance with gasoline-tax or inspection laws.

API has attempted to include all gasoline, whether sold for taxable or tax-exempt purposes.

What happened to Texas? . . . Although the national increase was smaller than expected, it fitted the pattern of the general slowdown in growth which started in 1956.

The big question remains: What's happening to Texas?

Texas' decline was the most remarkable aspect of the consumption pattern among the various states. It was the second drop in 2 years and the third slump in the last 4 years, according to API figures.

Texas consumption in 1960 fell 1.2% to 4.5 billion gallons. Following the 2.5% drop of the previous year, it reduced consumption to a level only 0.8% above 1956.

Market analysts have no explanation of Texas' subpar performance beyond attributing it to a sluggish state economy. And ironically that economy has been hurt most by a slowdown of the oil industry itself.

Other declines included: Alaska 0.9%, Delaware 1.3%, District of Columbia 2.1%, Louisiana 0.2%, New Mexico 6.4%, and West Virginia 2.9%.

It was the second consecutive decline for New Mexico; the second in 3 years for West Virginia, one of the nation's major depressed areas; and the second in 4 years for the District of Columbia.

Consumption pattern . . . Most of the big consuming states turned in below-average gains.

Only 2 of the top 10 states accounting for more than half of total U. S. consumption recorded above-average gains: New York, at 5%, and Michigan, at 2.8%.

The eight others in this group were California, Texas, Pennsylvania, Ohio, Illinois, New Jersey, Florida, and Indiana.

New York's big gain of 206 million gallons narrowed the gap between it and Texas, the second-ranked state, to 214 million gallons. New York accounted for one-sixth of the entire national increase.

California, gaining only 1.1%, still rose to the 6-billion-gallon level.

Border Oil Shuttle Vexes Import Officials

• Protests are flying over the way Pemex oil is being switched back and forth at Brownsville in a system that "evades" import controls. Step-up in the shipments may force quick decision on whether exemption continues.

A FURTHER INCREASE—perhaps as much as 10,000 bbl. daily—in Mexican oil being brought across the border at Brownsville may soon precipitate a decision on whether such exempt imports can continue.

An Oil Import Administration official says the amount of oil being brought in under the "Brownsville plan" averaged about 20,000 bbl. daily in March and signs indicate it will average about 30,000 bbl. daily in April.

He concedes that these imports have become a vexing problem. They are drawing particular fire from domestic producer groups which feel such imports are an "evasion" of the oil-import-control program.

The official says OIA is getting more protests over this situation than over any other phase of the control program.

Background of dispute . . . The controversy stems from the fact that the oil is brought into Brownsville by tanker, taken in bond across the border, and then hauled back into the U. S. by truck to qualify it as an "overland" entry exempt from import controls (OGJ, Jan. 16, p. 47).

OIA officials say the agency could change its rules to require an import license for the Brownsville imports, thus bringing them under the control program.

They admit, however, that the agency is reluctant to take this step unless it gets agreement from other U. S. agencies involved—principally the State Department.

What OIA officials apparently hope to do is to work out some solution that will enable them to avoid taking direct action to end the present practice.

The problem started when Petroleos Mexicanos lost a big U. S. customer.

This company, which had been buying 30,000 bbl. of Mexican residual fuel oil daily, said it had developed its own supply source.

Pemex officials reportedly told the U. S. Government that they had found a market for 15,000 bbl. daily, but needed a temporary outlet for the remaining 15,000 bbl.

Some State Department officials urged U. S. cooperation. They feared the fuel oil might be sold to Cuba.

A way out . . . At this point, someone suggested the "Brownsville plan." The U. S. Customs Bureau was asked to decide whether the oil could be brought into Brownsville under bond and then moved across the border into Mexico. The bureau's ruling was favorable.

OIA officials were advised of the arrangement and agreed to make no protest. They figured that technically the fuel oil to be trucked across the border from Mexico fell within the definition of an overland import.

Furthermore, they say, they were told that the project was only a temporary expedient and that imports would be restricted to residual fuel oil to be brought in for use as fuel only.

As things have worked out, the imports apparently are a topped crude that might be used as residual fuel oil but actually are being used in the refinery stream of a U. S. refiner.

This use of the oil has dismayed OIA officials, especially since the imports have been so large.

The situation probably will be aired at scheduled public hearings on crude-oil import controls—unless the U. S. revises or halts the "Brownsville plan" in the meantime.

Atlantic Revamps Producing

. . . department as the final phase of a long decentralization program. Big regional offices will be lopped.

ATLANTIC REFINING CO. last week announced a major revamping of its domestic producing department as a last step in a decentralization program.

Basically, the latest move calls for phasing out the big regional offices. District offices will be beefed up and district managers will have new authority and spending powers.

The streamlined structure, Atlantic says, will:

. . . **Move decision-making** as close as possible to the problems and operations.

. . . **Spell out authority** and define profit-making responsibility at field levels.

. . . **Provide better** and broader managerial training at each level of the organization.

. . . **Establish a system** to minimize overhead costs.

. . . **Shorten communications** and eliminate duplication.

W. Dow Hamm, vice president in charge of producing operations, says Atlantic expects to complete the reorganization within the next 6 months. Decentralization started in 1954.

The new setup . . . Atlantic now has five big regional offices.

Each region has individual production, exploration, land, and accounting districts.

As reorganized, the company will have only two regions of limited size—a western region at Midland, Tex., and an eastern region at Houston.

Along with two the regions, there will be three unattached districts—Canada, Rocky Mountains, and Oklahoma-Kansas. This is expected to be a temporary arrangement, however, with Canada graduating to regional status in "due course" and Oklahoma-Kansas and the Rockies

area merging into a fourth regional office.

The western region will maintain three district offices. Two, North Permian and South Permian districts, will be located at Midland. A New Mexico district will be at Roswell.

Eastern-region districts will be at Tyler, Houston, and Corpus Christi, in Texas and at Lafayette, La.

Normanna Ruling Followed Up By Sun Rehearing Bid

TEXAS OPERATORS are wasting no time in following up the Texas Supreme Court's Normanna decision which dealt a severe blow to small-tract drilling operations in the state last month.

Sun Oil Co. has asked the Railroad Commission for a rehearing on field rules adopted March 13 for Southeast Quitman (Rodessa) field of Wood County, East Texas.

The rules adopted for that field, which has a townlot drilling problem, provided allocation based 50% on the well and 50% on acreage—the standard formula used by the commission in such fields.

Sun, in its request for rehearing, maintains that this formula does not fit the requirements set down by the high court in the Normanna case because it prevents some field operators from obtaining their fair share of allowable.

In its petition last week, Sun alleged that a well completed on a 1-acre tract in the field would receive an allowable 2,053% greater per acre than a regular 40-acre field well under the 50-50 formula.

"This well will produce many times its recoverable reserves and drain the surrounding tracts which have no way to prevent this confiscation," the petition said.

Sun urged that the Rodessa allocation formula be reconsidered at an April 25 hearing.

Sun's petition was supported by Shell Oil Co. and Amerada Petroleum Corp. It bears out predictions that the landmark law laid down by the Supreme Court in the Normanna decision (OGJ, Mar. 13, p. 100) could apply as much to oil as to gas.

watching WASHINGTON

Clyde La Motte

• Residual fuel controls may become an issue again . . .

ANOTHER STUDY of residual fuel oil imports may be in the offing, this one by the Office of Civil and Defense Mobilization.

If so, the review will be to determine whether continuation of resid controls is justified as a national security measure. You will recall that when the program was instituted it was on the certification by OCDM that a defense need existed.

The question of whether resid controls are really necessary got some airing at the February hearing by Interior. However, national security justification was not an official issue.

Technically, at least, Interior has no say-so over the security aspect. That's OCDM's bailiwick. Actually, the decision as to whether OCDM will delve into the matter will no doubt be made at the White House.

• New director didn't come to bury OCDM . . .

THERE IS REASON to suspect that the new director of OCDM, Frank B. Ellis, is entirely willing to get into the residual fuel fray.

For one thing, Ellis has a reason for doing so: Atlantic Refining Co. and the politically powerful New England Council have filed formal requests with the OCDM for a review of the security justification. OCDM obviously must make some disposition of these requests.

Furthermore, OCDM could use a resid study as a springboard to get itself back into the public limelight.

At one time, OCDM carried a great deal of weight. Among other things it helped shape major policy affecting oil. But then its prestige waned. Those who know Ellis say he isn't the type who would come to Washington to sit at the bedside of a dying agency. Rather, they say, he will make vigorous efforts to revitalize OCDM.

He was sworn in only a short time ago and has been busy with plans for reorganizing the agency. This work has been behind the scenes, with no public spotlight on Ellis. Now that phase of preparation is about over and Ellis appears ready to emerge from the shadows.

When he does, the White House may face a problem of agency jurisdiction because Interior Secretary Stewart L. Udall has made it evident that he intends for his department to play the No. 1 role in oil matters.

• Another Kennedy appointee schooled in politics . . .

ELLIS BEARS the stamp noticeable in so many of President Kennedy's appointees. That is, he is alert, aggressive, and well-schooled in politics.

A lawyer, Ellis has been in the Louisiana Senate and a special assistant to the attorney general of Louisiana. He has been active in Democratic party work, too. In 1952-54 he was national committeeman and last year was director of the Kennedy-Johnson forces in his state.

Ellis has had considerable exposure to the oil industry. For instance, he has been a member of the Interstate Oil Compact Commission. It is likely he'll get further oil exposure, too—in Washington.

At any rate, those who had felt that the door was closed on the residual fuel issue may soon find that Ellis has reopened it.

Area-Pricing Ground Rules are Tough to Write

• Every approach brings objections from at least one group. Special committee named to attempt agreements.

SLOW progress was being made last week at the prehearing conference in Washington in attempting to reach agreement on what data should be required in area price hearings.

Although the conference was still in session at Journal press time, about the only real hope appeared to be the possibility of agreement for a study by producers to prepare area cost and economic data as a group to present at a future area price hearing.

However, distributor groups were dissatisfied with this approach unless provisions were made for requiring specific individual cost data in certain instances.

Producers objected, saying the end result would simply be a case-by-case study of all the producers in the Permian basin area—the "test pilot" area in the Federal Power Commission's first attempt to set area prices.

The FPC staff also wanted to be sure it could subpoena additional information that might not be included in the producer presentation at an area hearing.

Number reduced . . . The conference opened Wednesday with about 100 persons present. This was considerably below the number at the original session at Midland in March (OGJ, Mar. 13, p. 84), but it was obviously still too unwieldy.

So a special group of 14 was selected to spend the afternoon trying to work out agreements that would be acceptable to a majority.

When the large group met again Thursday there appeared to be some prospect of making headway, but before noon it became evident that a wide chasm still existed.

Chief Hearing Examiner Edward Marsh called the group back for an afternoon session, still hoping that a common meeting ground could be reached so that the stage could be set for starting the area price hearing itself in the near future.

The pre-conference sessions were behind closed doors, but agreements reached there—if any—will be put on the record in a formal, open session.

There had been hope at the outset that the FPC's recent action in specifying that utility type cost-of-service evidence would not be required or accepted might clear the way for establishing clear-cut guidelines to area-price hearings.

However, there is still a wide range of cost data, drilling depth information, economic trend figures and forecasts, and similar material that could be presented.

The purpose of last week's confab, therefore, was to try to specify what information was needed, what form it should be in, how it should be presented, and to what challenges it could be subjected.

Thus far, the use of the area-price approach as a time-saver doesn't seem to have saved much time.

Larkin Moves Into Top Spot of PESA

W. H. Larkin, right, president of Larkin Packer Co., Division Koehring Co., Waxahachie, Tex., last week became president of the Petroleum Equipment Suppliers Association. He succeeds Elliott Johnson, of Schlumberger Well Surveying Corp., Houston.

W. J. McWilliams, left, president of Republic Supply Co., Oklahoma City, was elected vice president. H. R. Safford, Jr., was reelected executive vice president of PESA at the association's annual meeting in White Sulphur Springs, W. Va.

PIEA broadens activities to cover automation

THE GROWING USE of electricity and automation in the oil business has caused one industry association to broaden its operations.

The Petroleum Industry Electrical Association voted last week in Galveston to include automation in its activities.

It also proposed that the Petroleum Electric Supply Association admit manufacturers and sales representatives of automation equipment to membership.

PIEA and PESA were holding their 33rd annual conference and exhibition in Galveston.

The PIEA decision on automation resulted from a survey of its 70 member companies, which include virtually all of the major domestic oil and pipeline companies.

India Foresees Upsurge in Oil Demand

• Consumption should double to 280,000 bbl. daily in 5 years, but government policy may cause lag in refining.

THIS is the first of a series of articles on India, a comparative newcomer to the roster of potentially large oil-consumer nations.

Ray G. Gibson
District Editor

INDIA has again raised its sights on demand forecasts, and now looks for oil consumption to just about double within 5 years.

An expected increase to 280,000 bbl. daily or more in 1966 from last year's 150,000 bbl. daily will be a big step toward the time when India will be one of the world's key consumer countries.

Per capita consumption of India's 438 million persons is only a few gallons a year. But as industrialization creates a growing demand, the per capita figure will soar.

The Indian Government also believes refining capacity will have to be more than doubled in the next 5 years—from the current capacity of 116,100 bbl. daily to 240,000 bbl. daily.

Oil companies believe the government estimate of demand may be low. They foresee annual gains which will push demand to 296,000 bbl. daily.

The hitch is that the government's stated purpose is to carry on all major refinery construction by itself.

Two new plants under construction in Northeast India, at Nunmati and Barauni, with a combined capacity of 45,000 bbl., are being built by the government with financial and technical help from Russia and Romania.

A third refinery will be built by the government at Gujarat in western India and is scheduled to go into operation in 1963.

The capacity will be between 30,000 bbl. and 60,000 bbl., depending on the productivity of Cambay and Ankleswhar fields, north of Bombay. At present, productivity of 40,000 bbl. daily appears to be the best guess.

Plants at Nunmati and Barauni will operate on crude delivered by a pipeline from Nahorkatiya and Moran oil fields in Assam. The production is operated by Oil India Private, which is two-thirds owned by Burmah Oil Co. and one-third owned by the Indian Government.

Expansion bids . . . Private refiners still are seeking permission to make major expansions of their plants.

If the financially pressed government falls behind schedule in adding process capacity, the need for product imports will increase—thus adding to the country's foreign-exchange payments. These import payments last year cost the country $210 million in foreign exchange.

Product imports of 40,000 bbl. daily are being planned for 1966 to make up the difference between refinery yield and demand.

A lag in refinery construction could mean that product imports would snowball on a big scale—since demand by 1971 is conservatively estimated at 500,000 bbl. daily.

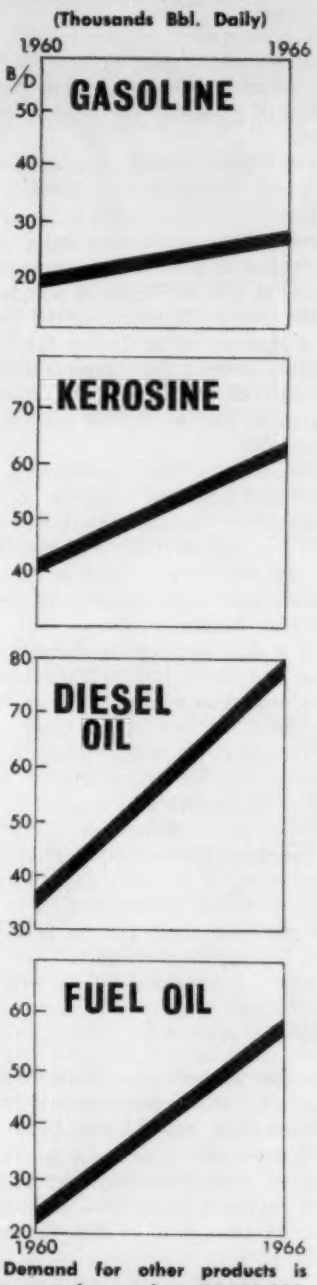
As it stands, however, any increases in capacity of privately owned plants must be accomplished through modifications of existing equipment. The refineries involved are Burmah-Shell's 50,000-bbl. and Stanvac's 38,000 - bbl. plants at Bombay, and the 15,000-bbl. Caltex plant at Visakhapatnam.

Not involved is Assam Oil's old 13,100-bbl. plant at Digboi, Assam. Throughput averages 9,700 bbl. daily, and no extensions are planned.

The Indian demand pattern is neither like the U. S., where gasoline is the chief product, nor Europe, where fuel oil is the leader.

Kerosine is India's foremost product today. But it is gradually

Forecasts for Indian Demand



Demand for other products is expected to go from 24,000 bbl. daily to 59,000 bbl. daily by 1966.

being substituted with diesel oil.

By 1966, high-speed and light diesel oils will account for about 29% of the market. Kerosine will make up 23%, fuel oil 18%, gasoline 10%, and other products the remainder.

Gas from Pakistan . . . Natural gas from Pakistan may be an important factor in India's fuel picture if India and Pakistan can make a satisfactory deal.

Representatives of the two governments are meeting in New Delhi this month to discuss Indian purchases of gas from Sui or Mari gas fields.

The biggest stumbling block may be price. Pakistan is offering gas to India at the same price as to local buyers. This would cost India the equivalent of about 9 U. S. cents per M.c.f. at the wellhead, in addition to the charge of amortizing the cost of a pipeline to the Indian border.

India favors a price formula based on cost of production and transportation, plus a profit it considers reasonable.

Pakistan is also considering a gas-based industrial complex, to be financed by Russia. Russia has already agreed to offer Pakistan financial and technical aid in exploration, and a delegation will visit Pakistan for further talks.

If a deal is made between Pakistan and India, however, the latter may import as much as 300 to 400 million cubic feet of gas daily.

Tentative proposals being considered are for shipments of Sui gas to Rajasthan and Gujarat, and of Mari gas to Rajasthan.

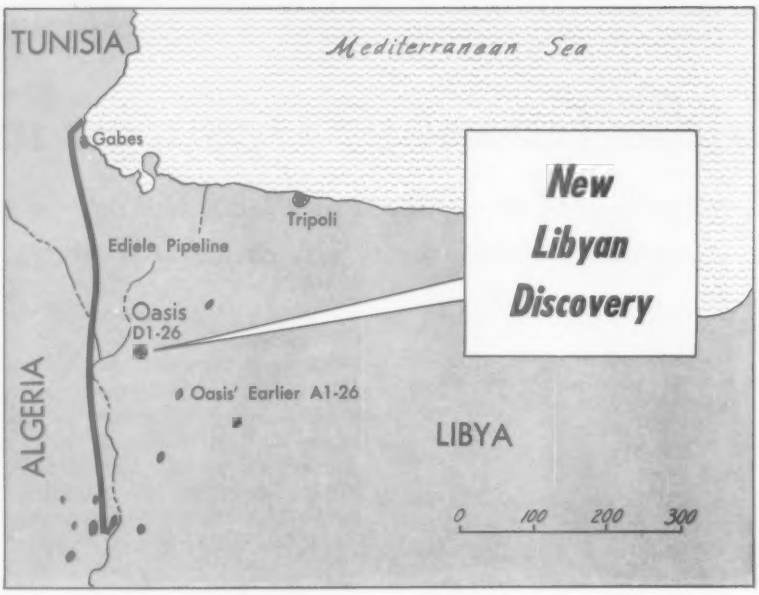
Sui was discovered by Pakistan Petroleum, a Burmah Oil subsidiary. It is one of the world's largest gas fields, with current production far short of potential.

Mari, a smaller field discovered by Stanvac, is shut in because of a lack of a market.

Pipeline progress . . . Work on the pipeline that will deliver crude from Nahorkatiya and Moran fields is well under way.

First spreads are laying pipe on 270 miles of 16-in. line from the Nahorkatiya area to the Nunmati refinery site.

The second section of the line, 450 miles of 14-in. pipe from Nunmati to Barauni, will be completed by the latter part of 1962.



Oasis Hits Again in Libya

- Second discovery made in Block 26, near the Tunisian border. Edjele pipeline system is within feeder range.

A SECOND discovery has been made in Concession 26 in western Libya by Oasis Oil Co.

The find, D1-26, had a recovery rate by swabbing which varied from 25 to 50 bbl. per hour. The 33°-gravity oil is from a depth of 4,300 ft.

The discovery is 77 miles northwest of A1-26, which was completed early last year as a 500-bbl.-daily well from a depth of about 5,700 ft.

Another well drilled 12 miles north of A1-26 found only gas in the producing zone of the first well.

D1-26 is within about 40 miles of the Tunisian border, and 65 miles from the 24-in. pipeline carrying crude from CREPS' Edjele fields in the French Sahara to a Mediterranean terminal at La Skirra, Tunisia.

If Oasis develops substantial reserves in the D1 area, one possible outlet might be a feeder line to the Edjele system.

Block 26 is Oasis' third concession in Libya to show commercial promise. Oasis, whose parent companies are Ohio Oil, Amerada Petroleum, and Continental Oil, is developing large production in Dahra field in Block 32 in North Central Libya. Output will move to the Gulf of Sirte via an 88-mile 30-in. pipeline.

Another major producing area also is shaping up in Block 59, south of Esso's Zelten field.

Italian Stations Purchased

INDIANA STANDARD is biting off a good-sized chunk of the Italian market with the purchase of a 25,000-bbl. refinery at Cremona and 700 service stations in northern and Central Italy.

The acquisition is being made through Amoco International SA, a Swiss subsidiary. When the purchase is final, the properties will be operated by Amoco Italia, a local subsidiary of Amoco International.

The refinery was owned by Italia Raffineria Olii Minerali SPA, and the service stations by Camangi SNC.

Amoco reportedly will pay a flat $14.5 million in cash.

Final details of the transfer are being settled. The properties are under court supervision in an abatement of creditors' proceedings. This is an action taken on behalf of creditors.

New Exploration Play Set in Spanish Sahara

AN AMERICAN independent has moved into a new and politically explosive exploration play in the Spanish Sahara.

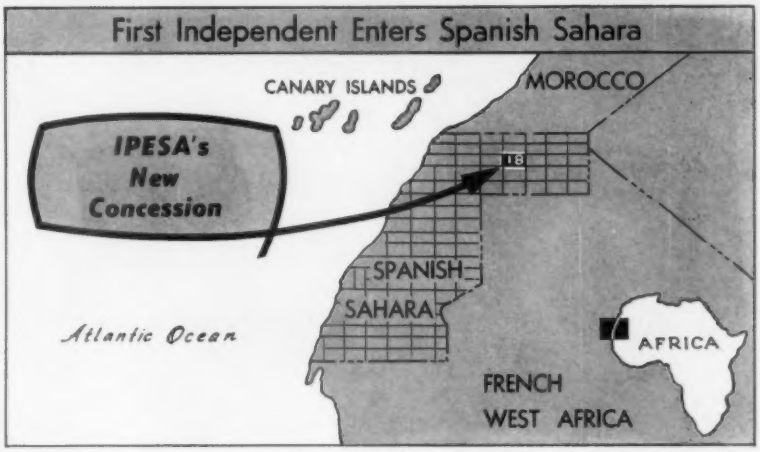
The Spanish Government awarded a 620,000-acre concession to Investigaciones Petroliferas, SA (IPESA), owned jointly by Magellan Petroleum Corp. and Oil Investments, Inc.

Officials of the two American companies said last week that IPESA almost certainly will have French, Italian, and Spanish interests before actual exploration gets under way.

The concession contract calls for IPESA to spend a total of at least $1 million over the next 6 years.

The new concession, in a disputed area on the northwestern coast of Africa, already has proved to be a troublesome area for Union Oil Co. and its Spanish partner, Cia. Iberica de Petroleos.

Union's first wildcat in the region, Daora 1-1, was placed under heavy guard after members of a geophysical crew working in the region were seized by Moroccans in a border dispute (OGJ, Apr. 10, p. 85).



The Spanish Sahara was only recently opened for oil exploration and portions of it are claimed by Morocco.

A number of American companies have been awarded concessions in the new area, but the latest award was the first made to an independent.

The IPESA concession, Block 18, is bounded on the north by a block held by Phillips Petroleum and on the west by a block held by General American Oil and the Spanish Government's Instituto Nacional de Industria.

The only drilling activity currently under way in the Spanish Sahara is the Union wildcat and a series of strat tests by Gulf-CEPSA.

Ohio Oil Wins Okay for Refinery in Spain

SPAIN has approved an Ohio Oil Co. proposal that will put the company into the European refining business and give it an outlet for some of its Libyan crude.

The American independent and its Spanish partners will build a 25,000 - bbl. refinery in northern Spain. An exact site has not been selected, but the company expects to locate the plant on the North Atlantic coast.

The installation is scheduled for completion within 3 years at a cost of about $18 million.

Ohio Oil will pay 84% of the total cost of the refinery. A group of Spanish business associates will provide the other 16%.

In return for permission to build the plant, Ohio and its associates have agreed to turn over 52% ownership in the refinery to the Spanish Government.

Another 4% will be turned over to Cia. Iberica de Petroleos, SA, a holding company partly owned and managed by the Fierro family—a prominent Spanish banking and industrial group.

Ohio will retain 28% ownership in the refinery. Its local partners will retain their original 16%.

Included in the project will be a marine terminal for large - size tankers and storage facilities for over 2 million barrels of crude and products. Ohio will supervise construction and provide technical assistance.

Bids have not yet been solicited, but an internationally recognized construction firm will build the plant.

Fuel oil will be the principal product. Kerosine, diesel oil, premium and regular gasoline, heavy naphtha, propane, and butane also will be produced.

Crude supply . . . Ohio has the right in the first 10 years to supply 100% of the refinery's crude requirements or 10 million tons (about 70 million barrels), whichever occurs first.

During the second 10-year period, Ohio will supply part of the crude requirements on a preferential basis.

Spanish tankers are expected to transport Libyan crude from Es Sider, on the Gulf of Sirte, to the refinery.

Ohio will have a substantial interest in the 300,000 - bbl. - daily Sidrah pipeline system which will carry crude from Dahra field to the Mediterranean coast.

The 88-mile 30-in. line will be built and operated by Oasis Oil Co., owned one-third each by Ohio, Continental Oil Co., and Amerada Petroleum Corp.

Part interest in the pipeline also will be held by Esso and Libyan American, whose crude from Mabruk field will be tied into the system via a feeder line.

Gabon Oil Search Being Extended Offshore

African exploration by Mobil, SPAEF will spread into Atlantic.

MOBIL International and SPAEF, a French partner, have signed contracts for a 16-month drilling program within jointly held offshore permits of Gabon and the adjoining Moyen Congo.

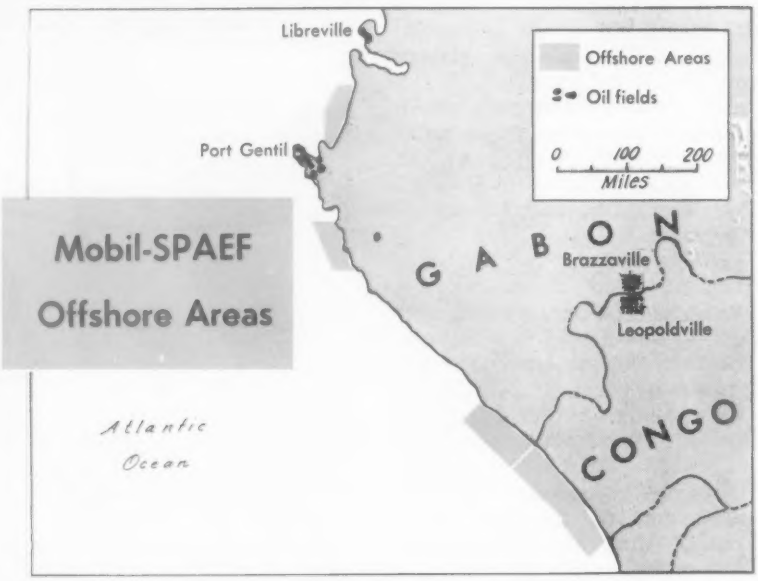
Offshore International, Baton Rouge, is expected to begin drilling in August from a mobile jack-up barge. The barge, now under construction, will be towed from Baton Rouge to Gabon.

The 80-by-97-ft. platform will have three 200-ft. caissons and will carry a 140-ft. derrick. The outfit will be able to work in water up to 140 ft. deep.

Two Mobil companies have a 50% interest in a total of 3,191,000 acres in Gabon and in 2,984,000 acres in the Congo under a farmout deal with SPAEF. The affiliates, Mobilrex and Mobil Exploration Equatorial Africa, Inc., initially planned to spend from $22.5 million to $45 million during the first 5 years. The agreement was reached 3 years ago.

Jointly held offshore acreage in Gabon lies immediately north and south of the Cap Lopez offshore zone, which SPAEF has reserved for itself. The French company produces 15,000 bbl. daily from a group of small fields on Cap Lopez Peninsula.

Other offshore acreage lies along the coast of southern Gabon and the Congo.



Mobil will be the operator on the offshore acreage. SPAEF is operator on joint onshore operations.

Several discoveries have been made in the onshore areas of joint operations. But it has not been disclosed whether any are commercial.

Batanga 3 is drilling below 7,746 ft. in an evaluation program at one of the most recent discoveries.

Iraq Exploration Halts After Oil Talks Sag

ALL EXPLORATION work in Iraq was shut down last week when the most recent effort of the government and Iraq Petroleum Co. to get together in talks about the future of the country's oil industry ended in apparent failure.

The latest in a long series of conferences on new terms ended abruptly after a brief 1-day session in Baghdad.

It was obvious that the Iraqi Government called a halt to the talks because the company would not agree to a number of the demands the Iraqis regard as basic (OGJ, April 10, p. 84).

G. H. Herridge, managing director of IPC, and his party returned to London after the quick trip to Iraq.

It has been apparent at the last two sessions of talks—in August and again in December—that Abdul Karim Kassim, the Iraqi prime minister, is becoming increasingly impatient over failure of the company to agree to his demands.

An IPC spokesman said last week the company has shut down its exploration work outside Iraq's proved production areas at the insistence of the government.

This means that three of the six drilling rigs active in Iraq are now shut down. In addition, IPC called in five geophysical parties and one geological field party at work in exploratory areas of the country.

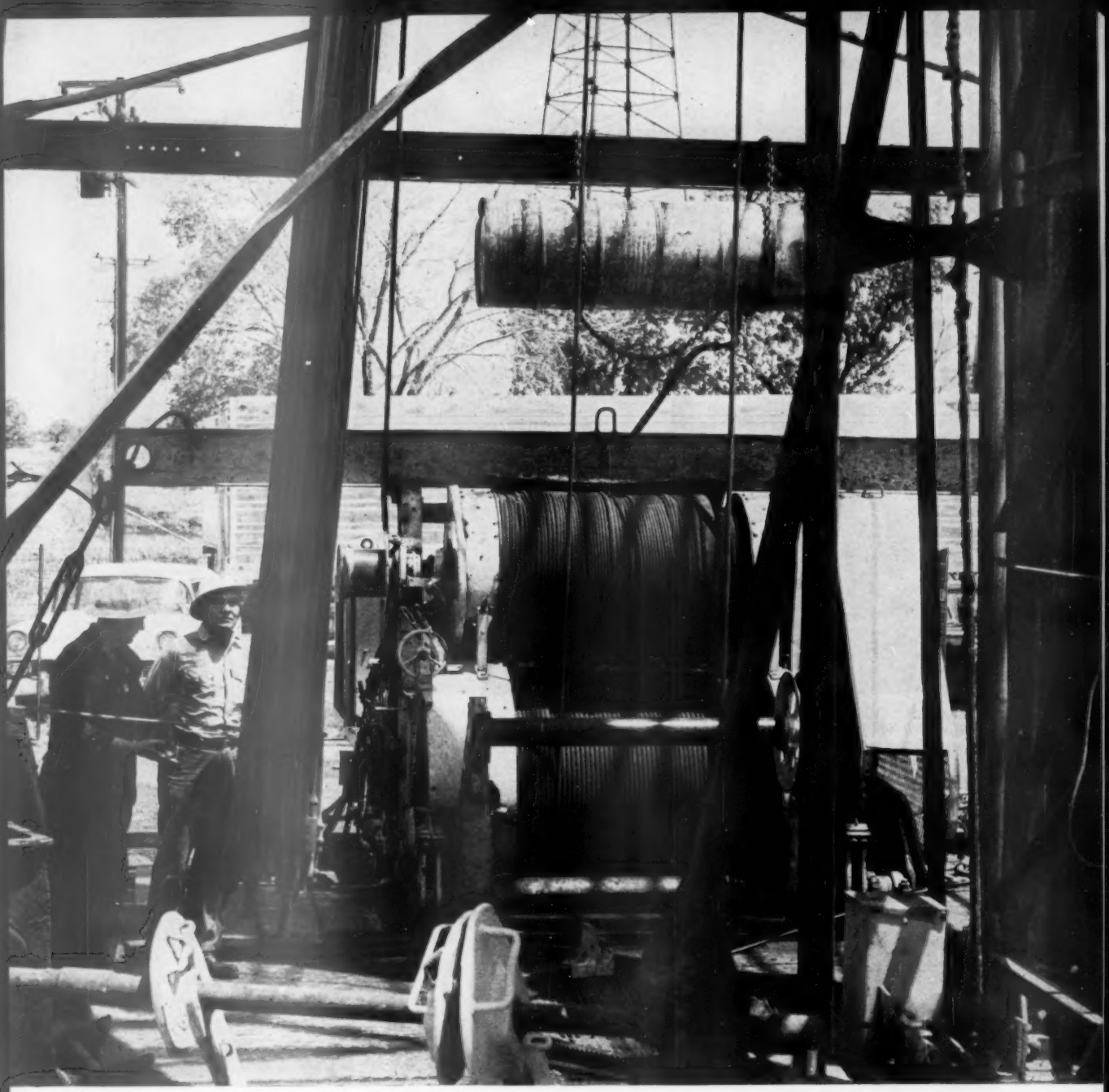
One of the three rigs was drilling a wildcat in southern Iraq in the area held under concession by Basrah Petroleum Co., an IPC affiliate. Two more were being operated by IPC in northern Iraq.

A rig at Luhais, about 25 miles west of Rumaila field, was drilling below 9,000 ft. at the time of suspension. Another at Jebel Hamrin, about 25 miles southwest of Jambur field, was below 2,276 ft. The third test, about 40 miles northeast of Kirkuk, was at 4,851 ft.

One of the basic demands being made by Iraq's Premier Kassim is that the IPC give up 100,000 sq. miles of the territory it holds under concessions that have another 40 years to run.

The IPC companies are balking because Iraq wants to determine which areas are to be relinquished and which can be kept by IPC.

Kassim's action in halting exploration apparently is aimed at forcing the IPC companies to comply with his terms. There was no comment from IPC sources last week, but it is doubtful that the companies will agree on this point.



Bethlehem Wire Rope on Work-Over Job in Oklahoma. This well-servicing unit, operated by Standard Drilling Company, is cleaning out a well in Oklahoma City. The Bethlehem wire ropes used were: Drilling Line—7,500 ft of 7/8-in. Non-Preformed, improved plow steel, with fiber core; Sand Line—8,000 ft of 9/16-in. Form-Set, improved plow steel, with fiber core. Bethlehem Wire Rope is used widely on well-servicing units because of its dependability. Cores available include: fiber, plastic-treated fiber, and solid plastic. We can also supply plastic filament rope-laid core.

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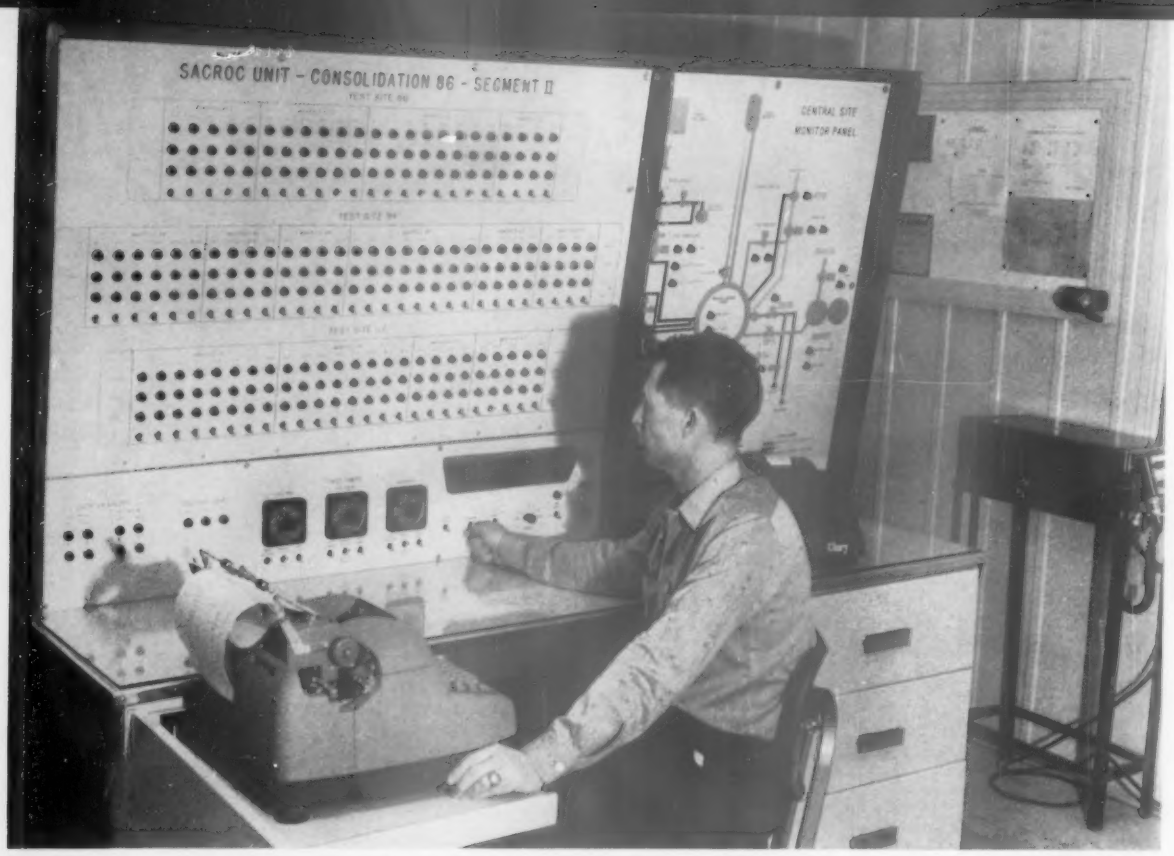


THIS MAN AND THIS BOARD are in complete control of the entire 50-well SACROC project. Vertical rows of lights at left are individual wells; groups of wells are arranged according to the manifold into which they flow and the test site serving them. Graphic panel at right shows status of equipment in central battery.

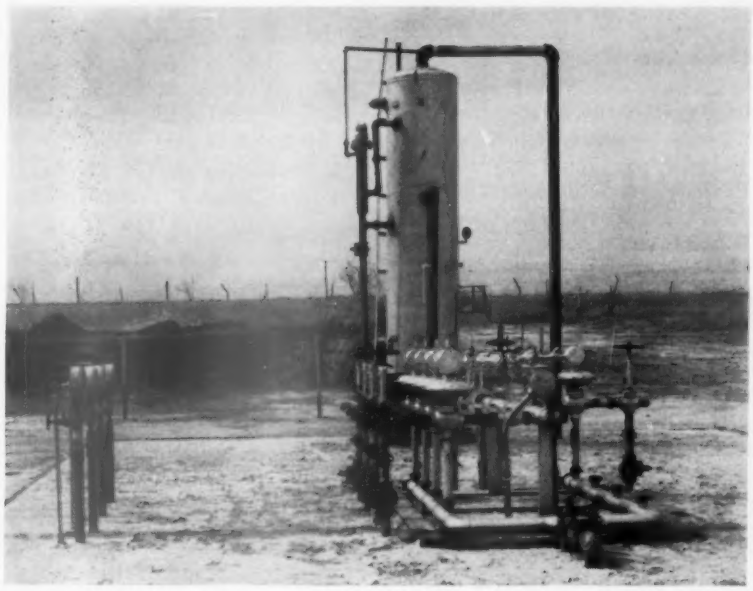
1. Consolidation
2. Automation
3. Supervisory control

= Mobil's three-part formula for cutting production costs at SACROC

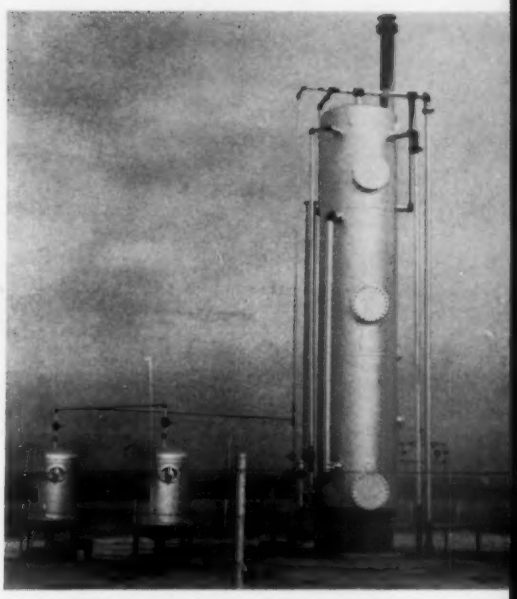
One man controls all 50 wells in a big block of the giant SACROC unit of West Texas. A new and sophisticated supervisory-control system automatically tests wells, records all data, and spots trouble. From the central control the operator is able to shut in or open up any well he chooses or put it on test. Tank-battery consolidation and central LACT round out an impressive and modern production operation.

BY ED McGHEE
Drilling Editor

PRODUCTION-MANIFOLD control equipment is contained in this pole-mounted box. Communication between this point and central control is on pair of telephone wires. Positive and negative pulses carry orders and messages.



FIELD MANIFOLDS are primary control points. High-pressure flow lines carry production from wells; choke and shut-in valve are in manifold, not at wellhead. Three-way, three-position valves on manifold can shut in, open to production, or divert to test any well. Separator handles production flow.



TEST SITE has treater to remove water from oil and dump-type meters to measure volume of both water and oil. Counter readings from production tests are relayed to central control where they are recorded.

THE COUNTRY'S biggest unitized oil field—West Texas' SACROC—has added to itself another distinction: it now operates the largest and most sophisticated supervisory control system in a United States oil field.

The system is newly installed by Mobil Oil Co. in a large area within the SACROC segment that company operates. Previously, Mobil had consolidated all tank batteries in the tract and automated many operations at the central battery. This combination of consolidation, automation, and supervisory control has these features:

1. Unattended operation. Only one man (daylight shift, 7 days per week) is needed to operate all 50 active wells.

2. Automatic well tests. Each well is regularly and automatically tested and results of the test are relayed to the central control.

3. Remote control. The man at central control can instantly shut in, open to production, or put on test any of the active wells.

4. Central LACT. All oil in the project is pumped out to pipeline autotmatically through a single LACT (lease-automatic-custody-transfer) unit.

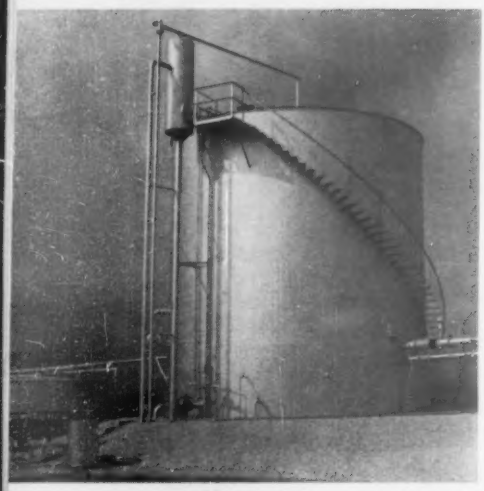
5. Alarm signaling. Warnings flash at the central control for any number of unusual conditions in the field, such as low well pressure or high fluid level in the separators.

6. Status indication. The central control board continuously shows the status (on production, shut-in, or testing) of every well in the project.

7. Record of changes. Status changes made in wells and other equipment are automatically recorded at the central control along with the time and date of the change.

Mobil expects that in the long run all these features will cut producing costs. If this proves true, the company will consider automation in similar fashion for all remaining producing wells within Scurry Area Canyon Reef Opera-

LOW-PRESSURE SHUT-IN SWITCHES on the individual-well flow lines guard against wells loading up and dying. When pressure falls, switches trip and shut well in until it builds up enough pressure to unload and flow again. Central control board shows the change immediately when switch shuts well in.



MULTIPURPOSE TANK at central battery serves as receiving vessel, treating tank, surge capacity, and pipeline-delivery tank. This and a few smaller seldom-used ones, are the only oil-storage vessels on the entire 50-well project.

tors Committee (SACROC) Segment II.

Big-scale operation. SACROC was unitized several years ago so that the giant reef could be water flooded. The unit's 1,257 wells are divided into 3 segments; the Mobil-operated segment contains 506 wells. Not all are producing; some are shut in with allowable transferred and others are water-injection wells. In the area chosen for automation, called the Project 86 area, there are 80 wells of which 50 are currently active.

Mobil began its plans for tank-battery consolidation and automation shortly after the unit went into operation. Even after many of the inefficient edge wells (and their batteries) were shut down, there were still too many batteries for lowest possible operating cost. These batteries contained a multitude of different kinds of equipment and all required a lot of labor for operation and maintenance.

By late 1959, the 13 active batteries in the Project 86 area had been replaced by a single central battery. The new arrangement, which contained many automatic features, operated conventionally until January 1961. At that time, the supervisory-control system went into operation. Now, the entire project is as nearly completely automated as modern technology can make practical and economical.

Four-Part System

We can divide the Project 86 system into four basic elements:

1. The 11 production manifolds in the field.
2. The three test facilities in the field.
3. The central battery.
4. The supervisory-control board.

Actually, the central battery is also the site of one of the production manifolds, one of the test facilities, and the supervisory-control house. The supervisory-control board at the central battery is connected with the field manifolds and test facilities by means of a pole-mounted, two-phone-wire network.

Production manifolds. Mobil has taken routine well control away from the individual wellheads and moved this important function to a number of manifolds throughout the project. At present, there are 11 such manifolds; the system can easily be expanded to include another three which may be made necessary as the SACROC flood progresses. At the manifold sites, there are these groups of equipment:

1. High-pressure flow lines. Full wellhead pressure is carried on the flow lines to the manifolds.

2. Low-pressure shut-in valves. Mercury-switch-operated valves close in well flow lines when pressure falls. Some wells die if not shut in when pressure drops. Shutting in wells as pressure falls allows them to build up sufficient wellhead pressure to resume flowing later without swabbing.

3. Production chokes. Individual manually adjusted chokes at the manifolds fix flow rate for each well.

4. Three-way control valve. This three-position valve can shut in the well, direct flow into a regular production header, or direct flow into a test header.

5. Production header. Ordinarily all wells (except when one is on test) flow into the production header and on to a separator.

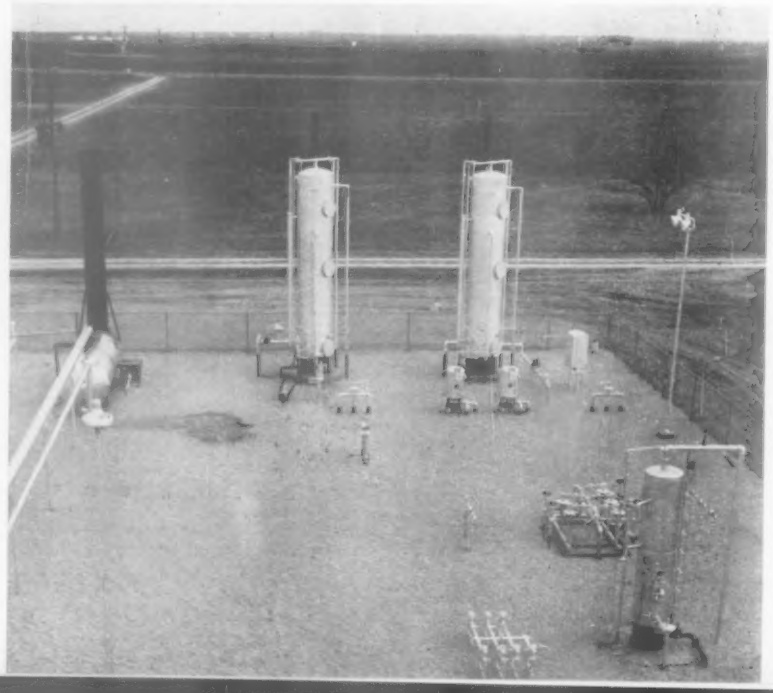
6. Test header. When a well is on test, it flows through the test header, into a special test line to one of the three test sites.

7. Production separator. Two-phase separators remove gas from the regular production stream. Water is removed at the central battery.

8. Supervisory-control box. A small pole-mounted box at each manifold receives the signals from the central control, makes the necessary switches, and then relays the information back to the central control.

Test facilities. One of the three test facilities is at the central bat-

COMBINED TEST AND MANIFOLD equipment occupies one section of the central-battery site. Other 2 test sites and 10 production manifolds are out in the field. Steam generator at left supplies heat for steam coils in big collector tank to remove b.s. and w. from incoming oil stream.



tery. The other two are in the field, each on the same site as one of the manifolds. The test equipment includes:

1. Three-phase separator. A gas-fired treater-separator vessel divides the incoming well stream into its oil, gas, and water phases.

2. Flowmeters. Meters measure the volume of oil, gas, and water as discharged by the three-phase separator.

3. Supervisory control. A small control box houses the electric gear for "zeroing" the counters of the meters, and for relaying back to central control the readings on meter counters when tests are completed.

Central battery. The central battery has this principal equipment:

1. Second-stage gas separation. A low-pressure vessel removes any free gas in the incoming oil stream.

2. Vapor-recovery unit. The low-pressure gas and vapors from the collection tank are processed for sale and to remove any recoverable liquids.

3. Collector-treating tank. A single 4,000-bbl. tank serves as receiving vessel, treating tank, surge capacity, and pipeline-delivery tank. A water level is held in the bottom of the tank and cast-iron steam coils supply heat to remove water from the oil. Clean oil leaves near the top of the tank.

4. Low-pressure steam generator. This generator supplies steam to heat the collector-receiving tank.

5. B.s. and w. monitor. A stream of oil from the pipeline outlet of the tank is constantly circulated past a capacitance-type b.s. and w. monitor. The unit triggers an alarm and prevents the pipeline pump from operating if b.s. and w. content is too high.

6. Pipeline pump. Level switches in the tank operate the pipeline pump. When oil level reaches the top switch, the pump starts and runs until level falls to the lower switch. The pump cannot run if b.s. and w. content is too high.

7. Emergency storage. If for any reason the pipeline pump does not move the oil out of the main tank, the oil can gravity out into a number of smaller storage tanks.

8. LACT unit. A skid-mounted LACT unit measures the clean oil through a positive-displacement meter. A composite sample is automatically collected .

Central supervisory control. The supervisory-control board is in a small building at the central battery. Here, the one-man operating force oversees and controls the project. The control has six main parts:

1. Graphic panel for field. Lights on the panel are grouped to represent each of the wells according to the manifold it flows into and to the test facility serving it.

2. Graphic panel for central battery. This panel is direct-wired with the battery's equipment so that lights show which equipment is operating at any moment.

3. Control switches. Toggle and knob-type switches on the panels allow the operator to control the equipment in the field.

4. Test-result typewriter. The results of all tests are written out on an electric typewriter.

5. Status-change printer. This machine types out a continuing record of all status changes in the project along with the time and the date these changes were made.

6. Electronic gear. The necessary wiring, switches, diodes, relays, capacitors, resistors, etc. are housed in a cabinet behind the graphic panels. The equipment is arranged on slide-out trays for easy service.

Control System

The entire supervisory-control system for Mobil's Project 86 was set up for trial at the Houston plant of the manufacturer before being sent to the field. After the system proved to be in good working order, it was installed at SACROC by the manufacturer's personnel.

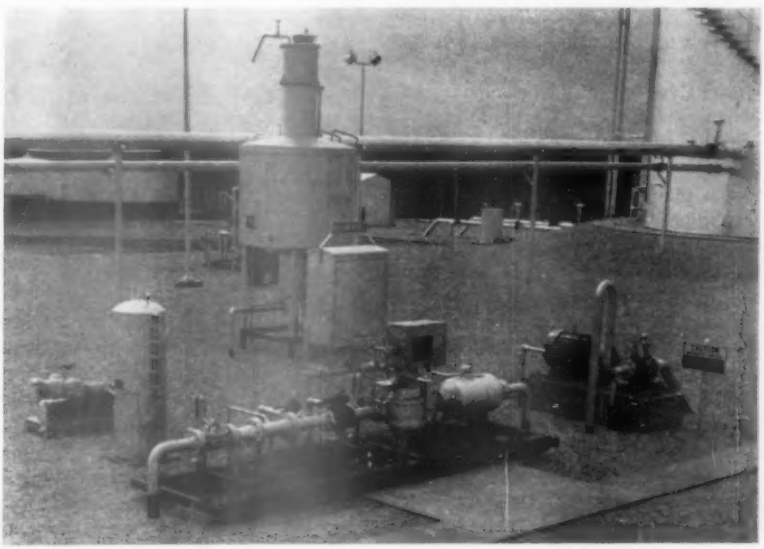
There are several important features of the over-all system:

1. Failsafe. If there is a total power failure, everything shuts down. When power returns, everything resumes normal operation automatically. If storage at the central battery fills to capacity, the entire system shuts down.

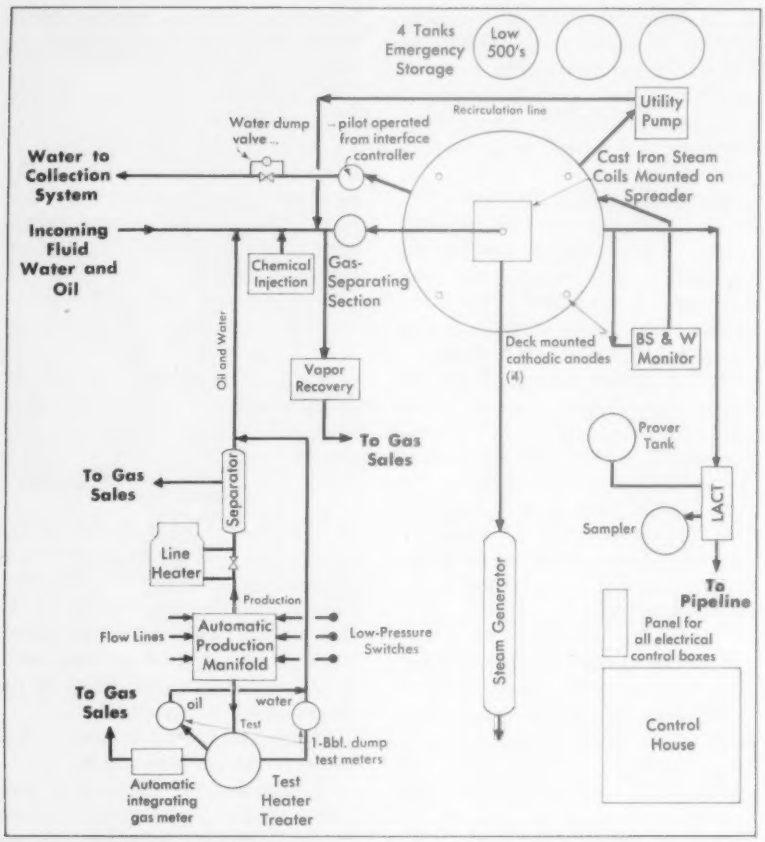
2. Pulse telemetering. All telemetering is done with positive and negative pulses.

3. Reliability. Mobil and the manufacturer have gone to great lengths to insure the reliability of the system. High-quality components were used. Stepping switches are enclosed in hermetically sealed boxes and have gold-plated contracts. All relays are hermetically sealed and are the plug-in type for easy replacement.

4. Power consumption. Electric current at 117-volt single-phase a.c. goes directly into the control equipment into the field. The two power lines are carried on the same poles which carry the phone-wire control signals. Standby power on a manifold site might be only 60 watts.



LACT UNIT is skid-mounted, positive-displacement-meter type. Pipeline pump is upstream of LACT unit at right. Meter prover tank is at rear. Composite sampler takes representative sample of oil going out to pipeline. This is only sales point for entire 50-well project.



SIMPLE AND EFFICIENT LAYOUT marks the central battery and control site. Thirteen active batteries had been consolidated into this one crude-handling system before supervisory control was installed. Operation was conventional before the automatic system took over almost all manual jobs.

Individual wells. None of the control equipment is installed on the wells themselves. Since chokes and shut-in valves are located at the manifolds, effect is the same as if the wells themselves were actually at the manifold sites.

Manifold sites. There is only one thing at the field manifolds which can be remotely controlled; that is the three-way, three-position valve. This valve is gas-operated but the gas is controlled by a small electric solenoid. In one position the solenoid directs gas below the diaphragm; this opens the valve to the test header. In its second position, the solenoid puts gas above the diaphragm; this would open the valve to the production header.

With no power on the solenoid, there is no gas on the valve diaphragm. Since it is spring-loaded, the valve returns to its middle, no-flow position.

By means of this valve, then, the operator at central control can send directions to switch a well into production, into test, or shut it in.

In addition to being operated by remote control, the three-way valves can be shut in by two other means: the low-pressure line switch and the high-level switch in the production separator. These switches are directly wired into the control system so that either can close the three-way valves without orders from central control.

How does the operator at the central battery make the three-way valve change positions? He does it by "dialing" a number just as if he were making a phone call. The dial system has three numbers, the first two identify the well (valve) and the third tells the valve what to do. Suppose the operator dials 311. This tells well 31 to flow into the production header. Dialing 312 would put well 31 on test; 313 would shut it in.

Suppose, then, that the operator at central control dials 313; he wants well 31 shut in. After he dials, the signal goes out (in coded pulses) to the control box on the manifold into which well 31 flows. The control box answers its call just as an individual might answer a telephone. The operator sees the numbers light up on his control board so he knows he has reached the box he wanted. It sends back its identifying number and the code for the instructions it received. He then punches a "proceed" button and the electric switches close to close in well 31.

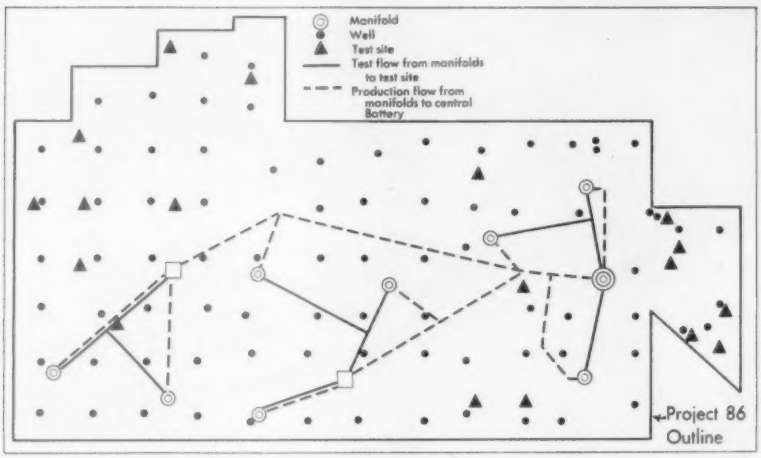
Status scan. How does the operator know that well 31 has closed in as he ordered? He gets a signal from the "scanning" equipment. Each of the control boxes at the manifolds has its own scanner. These instruments are relatively new to the oil industry. Older scanners worked constantly or at regular intervals by the clock.

The new scanner works only when instructed by the control system or when there has been some change at the manifold.

Let us say that the operator at central control has again dialed 313—to close in well 31. Twenty seconds after he presses the proceed button, the scanner starts in action. It scans the position of every valve in the manifold in sequence; it sends the pulse code back to the central control, verifying the position of every valve. Thus, the operator gets a positive indication of every well.

Let us suppose that well 31 has loaded up and wellhead pressure has fallen low enough to trip the mercury switch in the flow line. The switch causes the three-way valve to close in well 31's line. Immediately the scanner starts to work. And, automatically, it notifies the central control of the new status of well 31. A light on the graphic panel shows well 31 closed in; the printer types out in code that well 31 closed in at an exact time on the exact date.

Test sites. At the test sites, there is only one piece of equipment which can be remotely controlled. This is the "zeroing" device on the counters which accumulate test results. There is a digital counter which records the barrels of oil passing through the oil dump meter; another counter registers the



TWO PIPELINE SYSTEMS run through the Project 86 area. One carries regular oil-production stream from manifolds to central battery. Second carries individual-well flow from manifold to test site. Mobil saved on cost by using old lines already in place before unitization and battery consolidation.

barrels of water passing through the water meter. And, a third counter registers each M.c.f. of gas passing the gas-test meter.

By dialing the proper number, the operator can bring each of these counters back to zero.

The counters can also be read remotely. By dialing another number, the operator can get a readout of the counters, printed out on the electric typewriter at the control board.

The system operator can manually test any well he chooses merely by dialing the proper code on his control panel. However, this is seldom necessary. The system is set up to test every well automatically and regularly. Usually, there will be three tests going on simultaneously, one at each of the three test sites. Let us go through a typical test cycle.

Let us say that the time has come to test well 43. Then central control automatically dials 432—the code which switches well 43 into the test header. This starts a "purge timer" which allows time (up to 2½ hours) to clear any fluid left in the test line after the preceeding test. At the end of this purge time, another signal goes out automatically, zeroing the test counters. The scanner reads the counters and sends back these figures. Ordinarily, the counters will read zero; if for some reason the digits are other than zero, the actual figures are printed out. Thus, the operator has a check on his initial readings.

After the counters are read, the test timer starts; it can be adjusted for test durations up to 30 hours. The control does nothing after this; only the counters are operating, accumulating the well flow.

When the test timer runs out, signals go out to read the counters. These readings come back and are printed out along with the well number and time of the reading. The well is switched back into the regular production header and the next well in sequence begins its test.

Suppose that something goes wrong while a test is in progress? Let us say that for some reason fluid level builds up in the test separator. Obviously, flow into the separator must be stopped. For this reason, the test vessels have a high-level switch. When fluid level reaches this switch, it starts the central control into operation. Result is a premature end of the test. The counter readings to this time are printed out. The scanner finds the well which has been on test and switches it back into the regular production header. All these facts are printed out with the time and date and no other well will be put on test until the trouble has been cleared.

Central board. The control board has two systems on it—the remote telemetered section and the direct-wired indicating panel for the central battery. There's only one linkage between the two. When there's a high level in the collector-treater tank, the control shuts down the entire project by closing the three-way valves on all manifolds.

The telemetered section handles the field manifolds and the test facilities. As described, these can be operated either automatically by the control system, or by the operator dialing in commands. What prevents conflict between automatic commands and dialed-in commands? Interlocks in the system make it impossible to dial in a command while an automatic one is in progress. In the same manner, the automatic processes are locked out while the operator dials in a signal.

The central-battery panel simply shows status; it shows if pumps are running, if oil is clean, or if tank levels are high. The panel does not allow control of the equipment. Such control is unnecessary since the control house is located at the central battery.

There are two recording machines at central control. One is an electric typewriter which automatically types out all test data; information can also be typed by hand on this machine. The other device is a printer; it automatically types out in code every change in status in the project along with the time and date of the change.

When there is an unordered change of status (such as high fluid level or low well pressure), the central control turns on an alarm light. This notifies anyone in the area that there is trouble.

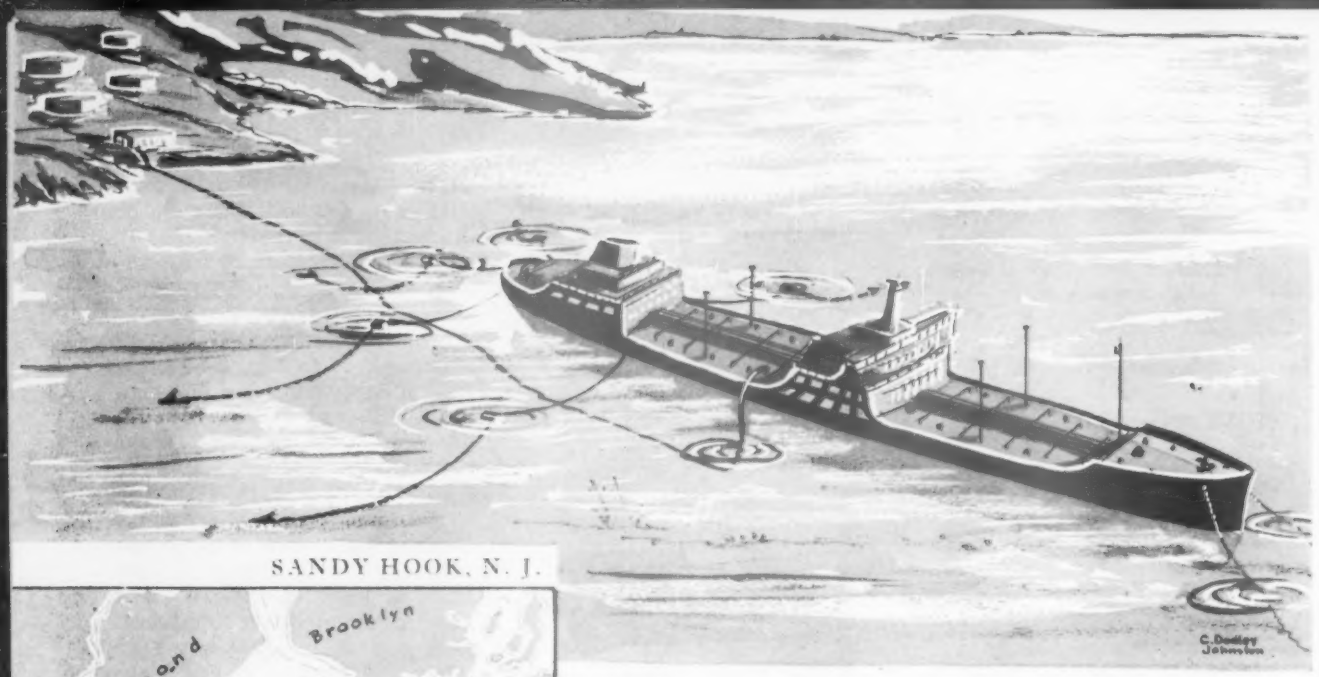
The control cabinet itself is necessarily complex. It alone contains 20,000 ft. of wire. The entire system contains 900 relays, 150 stepping switches, 2,000 diodes, 300 resistors, and 800 capacitors.

Still, the central control is designed for the greatest simplicity possible. Terminal points have been grouped onto 10 trays of 120 points each. Almost all connectors tie into these trays. Result is that "system test" time is relatively short and almost all points in the system can be reached easily for meter and oscilloscope tests.

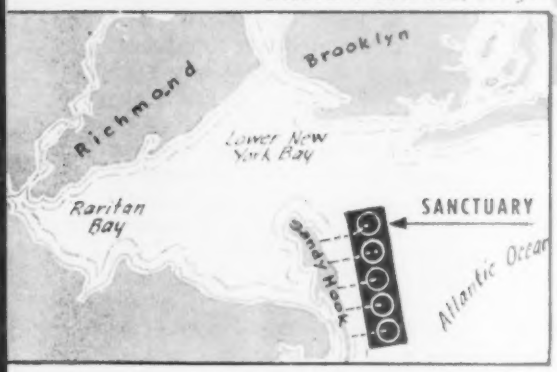
The system has been designed so that extra wells can be brought into control with little additional equipment.

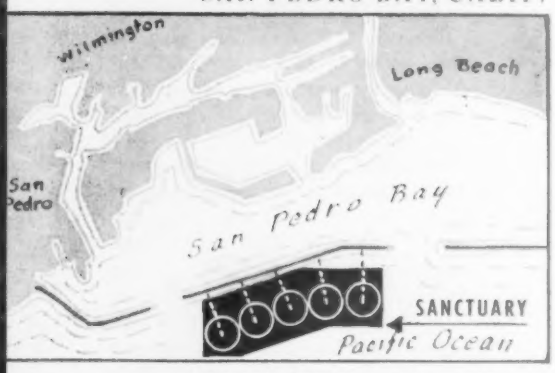
Acknowledgment

The author expresses appreciation to the personnel of Texas Instruments, Inc., designer of the control system, for their help in preparation of this article.



BASIC PLAN for submarine-line sea terminal. The terminal buoy system is key and heart of the supertanker sanctuary.





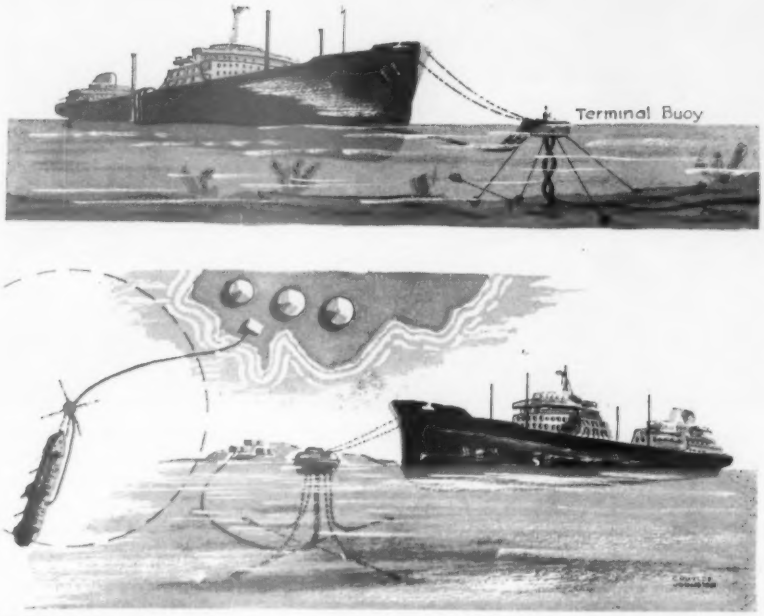
SANCTUARIES are sorely needed for the ports of New York, Los Angeles, and Houston. The New York sanctuary could be located just off Sandy Hook, just below Lower New York Bay. The Los Angeles sanctuary could be located in outer San Pedro Bay, off Long Beach, just outside the breakwaters. The Houston sanctuary could be located in the Gulf of Mexico, off Galveston.

Needed: Supertanker carriers have outgrown

THE TANKERS in the world fleet are growing bigger each year while the ports serving these supertankers are still in the World War T-2 class.

An example of the need for improved harbor facilities is afforded by the Princess Sophie, a 71,282-dw.-ton tanker owned by the Niarchos interests and used in moving crude oil to the United States. The tanker has a 44-ft. draft, which means only two U. S. ports—Los Angeles and Long Beach — have harbors deep enough to accommodate the tanker.

If the Princess Sophie is scheduled to dock at Philadelphia, here's the procedure the tanker has to follow to unload its 647,500-bbl. cargo: First she anchors in Delaware Bay to await T-2 tankers to lighten the load; then there is a wait for a favorable tide; and finally she proceeds approximately 90



TERMINAL BUOY SYSTEM, upper sketch, is development of AB International Marine & Oil Development Corp. Lower sketch shows typical tanker mooring using IMODCO buoy installation.

sanctuaries—the new their T-2 model ports

By COMMANDER BERNARD FRANKEL

. . . commanding officer of the U. S. Navy Military Sea Transportation Service Office in Long Beach, Calif. He is a 1939 graduate of the Pennsylvania Maritime Academy and has served 20 years in the Navy. He also served 2 years as a deck officer in the Merchant Marine.

The opinions or assertions contained herein are the personal ones of the author and are not to be construed as official or reflecting the views of the Navy Department or the naval service at large.

miles to a discharge berth to complete the unloading.

This problem is repeated in all ports other than Los Angeles and Long Beach, and can lead to many days' delay in unloading a cargo.

As a solution to the growing problem of tankers outgrowing ports, it is proposed that there be established deepwater restricted areas known as supertanker sanctuaries to permit continuous and safe discharging of supertanker cargoes.

The key and heart of a sanctuary would be the terminal buoy system—a large floating vessel capable of safely securing a ship of any size, in any kind of weather and current, and permitting the loading and unloading of liquid cargoes.

Setting up supertanker sanctuaries would provide these advantages:

- Permit complete freedom of movement of supertankers.
- Evade restrictions imposed by narrow, winding, and shallow channels.
- Preclude costly harbor development and subsequent continued maintenance.

1. The IMODCO Buoy

The terminal buoy system proposed in a sanctuary was introduced in July 1959 when it was demonstrated by the Royal Swedish Navy.

The system is called the "IMODCO Buoy" for its designer and manufacturer, AB International Marine & Oil Development Corp. of Stockholm, Sweden. The system is being installed at a cost reported to be considerably lower than any petroleum wharf or existing type of offshore petroleum loading-discharge station.

The IMODCO system also is operating efficiently in areas where the traditional fixed multiple-moor submarine sea-line terminal would be either impractical or uneconomical.

Basically, the buoy is a large circular structure, similar in design to the standard mooring buoy. It is firmly secured to the sea bottom by the stoutest of ground tackle. A vessel moored to the system is secured to a specially designed hook mounted on a swivel. The swivel permits the vessel a 360° swinging privilege, permitting her to head into the wind or sea, whichever is stronger. The buoy's flexible hoses are coupled to the ship's cargo system and transfer proceeds through submarine pipelines.

Because of the buoy's unique mooring arrangement, ships can be secured to it in winds of hurricane strength (65 knots, Force 12 Beaufort scale) during which other offshore terminals cannot be approached and when docking would be completely out of the question for even the most seasoned pilots or mariners. Once moored, the vessel rides at her most comfortable position.

The terminal buoy system can be installed in unprotected waters and may be located as far from shore as necessary for the draft of the vessels. An IMODCO system of 12.5-m. diameter is being installed for the SAROM refinery in Ravenna, Italy, approximately 7 nautical miles offshore in the Adriatic Sea. This system will be able to handle vessels up to 76,000 dw. tons.

This then, is the proposed heart of a supertanker sanctuary. An inexpensive, all-weather, all serviceable, easy-to-install-and-to-maintain facility.

The advantages of the IMODCO system are many, including:

1. Permits liquid cargo to be delivered anywhere—directly to the

PRINCESS SOPHIE, 71,282-dw.-ton tanker of Niarchos interests, is example of ships requiring supertanker facilities. Length is 859 ft.; breadth is 115 ft.; and draft, summer freeboard, is 44 ft.

areas of use and without the aid of docks or harbors. This feature makes possible, among other things, the delivery of petroleum to the closest vicinity of refinery sites, providing access to new areas for industry.

2. Makes possible savings in real estate, installation, overhead, and operating expense of an oil dock. It costs less than other terminals of equal capacity and can be operated at much less expense.

3. Can release valuable dock space to other commercial uses.

4. Substantially reduces the time a vessel must wait for loading or discharging facilities.

5. Permits oil from newly tapped fields to be easily transported by tank-vessel from the nearest coastal point, or from offshore wells, thereby bypassing the construction of costly pipelines to a suitable harbor and expensive terminals.

6. Eliminates the "battle of the budget" for the harbor and channel improvements funds needed to satisfy the growing wants of the supertanker.

7. Precludes fire and disaster hazards in congested or populated areas and localizes all fires, no matter how extensive, to the ship itself.

8. Greatly minimizes the risk of collision in crowded harbors where vessels must be piloted into position of a berthing area. Vessel approaches the buoy directly at slow or dead speed with an absolute minimum of maneuvering. Pilotage and tug costs are drastically reduced or eliminated.

9. Lessens the danger of harbor and sea pollution by oil, which in serious cases can cause closing down of port operations. Contamination of nearby beaches, yacht moorings, and inside harbor works is eliminated.

10. Makes practical the location of oil-tank storages in localities remote from population centers.

11. With the U. S. Coast Guard safety and operating regulations in mind, the supertanker, due to its vast deck expanse, is readily adaptable to helicopter service when moored to a terminal buoy, for stores, provisions, and movement of personnel.

2. Proposed Sanctuaries

Three sanctuaries are proposed in order to give the U. S. more adequate port facilities to keep in step with the growing size of tankers. These sanctuaries should be in New York, Baytown, Tex., and Los Angeles, three important petroleum-shipping centers.

Briefly, here are proposals for these three ports:

The area east of Sandy Hook at the port of New York is a suitable location. The sanctuary should be designed to handle the biggest tankers now on the drawing boards. Provisions should also be made to handle highly explosive liquid cargoes moving into New York to serve a growing petrochemical industry.

The port of New York, the nation's busiest port, has a maximum controlling channel depth of only 37 ft. There also are dangerous congested areas at the terminals on Arthur Kill, Newark Bay, Kill Von Kull, and the East River. There is no room in the channel for vessels drawing over 35 ft. of water.

The best location for a sanctuary in the Houston-Baytown-Galveston area would be 8 to 10 miles south of Galveston and Bolivar Roads in the open sea. This should also be a deepwater terminal providing safety and adequate room for the supertankers now on the boards.

Baytown, which is on the Houston Ship Channel, is heavily trafficked 33 miles from the sea. The Galveston Bay Channel is only 38 ft. deep and should have to be increased to 44 ft. for a supertanker in the class of the Princess Sophie, which draws 38 ft. Any mariner recognizes that a large vessel when inshore and on soundings must have at least 6 ft. of water under her keel to permit proper maneuvering ability and to allow for pitch and roll.

The 4.5-mile outer bar channel presents another problem at Baytown, and to reach a depth of 7 fathoms (42 ft.) requires dredging another 1.5 miles out to sea, according to recent estimates.

The need for a sanctuary is not as great in the Los Angeles-Long Beach area, but should be considered. Most of the petroleum traffic in these ports is located in a semicircle around Cerritos channel.

There is ample room close to the seaward side of the San Pedro breakwater at Long Beach for a sanctuary, but of the three proposed, there is not the pressing need in the Los Angeles-Long Beach area.

Two oil companies have played important roles in providing adequate port facilities for supertankers.

One of Long Beach's most important building projects is a supertanker terminal recently placed in service by Richfield Oil Corp. This $1,390,000 terminal is the only marine bulk oil terminal in the U. S. capable of handling 1,000-ft. tankers drawing 48 ft. The 3-mile navigation channel from the wharf to the sea has been dredged to 55 ft.

At Los Angeles, Union Oil Co. has a supertanker terminal completed in 1958 which regularly serves 60,000-dw.-ton vessels with drafts of 44 ft. The terminal has an approach channel and turning basin 46 ft. deep. The approach channel from San Pedro breakwater to the wharf is 500 ft. wide and has a turning basin 3,000 ft. in diameter.

Two submarine-line sea terminals at Los Angeles also help partially relieve the supertanker congestion. One is located at Standard Oil Co. of California's El Segundo refinery and the other at Wilshire Oil Co.'s Huntington Beach terminal.

3. Growth of Tankers

A study of the various reports made on the growth in the size of tankers indicates that the average size of the tanker afloat during the next 5 to 10 years will approach and very likely exceed the size of today's supertankers.

A recent study by W. G. Weston, Ltd., London, showed as of October 1960 the world tanker fleet (vessels over 7,000 tons) totaled more than 58 million dead-weight tons. This is more than triple the size of the pre-World War II tanker fleet. The report also showed that 40,000-ton tankers, nonexistent 6 years ago, now account for almost 7 million tons and will rise to 19 million tons by 1964.

Sun Oil Co.'s recent analysis of the world tanker fleet pointed out there were 523 ships of approximately 19.8 million dead-weight tons building or on order at the end of 1959.

These tankers, according to the Sun report, average 37,000 dw. tons with a 38-ft. full-load draft as compared with an average of 22,300 dw. tons and 32-ft. draft tanker of late-1954 vintage.

The size of today's supertanker is pointed up by some statistics on three present-day tankers and one (Niarchos Vessel) now under construction and two Japanese vessels recently placed on order.

Ship—	Length	Draft	Dw. tons	Cargo (bbl.)
Penna Sun	745 ft.	33 ft. 11 in.	50,260	373,750
Sansinena	810 ft.	44 ft. 6 in.	60,000	460,000
Princess Sophie	859 ft.	44 ft.	71,282	647,000
Niarchos Vessel	940 ft. 5 in.	49 ft. 11 in.	106,500	907,000
2 Japanese vessels	955 ft.	54 ft.	130,000	900,000

4. Present Facilities

A review of Coast and Geodetic Survey Coast Pilots of the U. S. reveals there are over 40 principal ports and harbors in the U. S. that have authorized maximum channel depths of 35 to 40 ft., but only 6 have authorized channel depths of 40 to 45 ft.

Responsible organizations and agencies are keenly aware of the great need for harbor improvements to keep in step with the supertanker growth, but, unfortunately, the harbor improvement progress is a prolonged and involved exercise fraught with the rocks and shoals of the economic and political seas.

Also patience is an absolute essential for one seeking federal assistance for port or harbor improvements. It takes from 4 to 7 years to get a project under way once a local harbor department makes known its desires.

The offshore terminal serviced by a submarine pipeline has helped to a limited degree in some parts of the country. Submarine-line sea terminals have been in operation on the California coast for years. However, there is only one on the East Coast (located at the Northville Dock Corp., Long Island) and none on the Gulf Coast.

The submarine-line sea terminals have some disadvantages which are overcome by the IMODCO terminal system.

The biggest advantage of the IMODCO system over the submarine-line sea terminal is the ability of tankers to ride out rough weather while moored to an IMODCO system and to continue to load or unload during an upsetting storm.

5. Conclusion

Only three of our major petroleum port areas have been discussed, but the same problems and conditions are common in varying degree to all of our major petroleum ports.

Similarly, the supertanker with its attendant problems is being faced throughout maritime United States.

These are the problems of:

1. Greater influx on the world scene of the supertanker.
2. Insufficient channel depths to accommodate the supertankers.
3. Prohibitive costs in the initial dredging and later the maintenance to handle the supertankers.
4. Density of petrochemical plants in port areas and the lack of geographic dispersal plans for the petrochemical plants.
5. Inadequacy of facilities to provide for offloading or loading of tankers in event of an emergency.
6. Failure to gain port efficiency and utilization of all available space, both water and land areas.

The supertanker sanctuary via the medium of the terminal buoy system offers a positive means of correcting the burdens of the above problems. Their adoption and establishment in or adjacent to our major petroleum ports and in selected dispersed points along our coasts are a must.

How Major Ports Compare

(Ports listed below received 80% of U. S. crude petroleum imports based on report by Maj. Gen. E. C. Itschner, Chief of Engineers, U. S. Army, in June 1958)

Port	Per Cent Imports	Authorized Channel Depth (in ft.)
Philadelphia	20	40
Portland, Me.	19	35
New York	17	35 to 48
Marcus Hook, Pa.	11	40
Paulsboro, N. J.	4	40
Houston	3	40
Los Angeles*	3	35
Richmond, Calif.	3	35

*Ports of Long Beach and Los Angeles have deepened segments and are capable of handling vessels of 44-ft. and 50-ft. draft respectively.

DRILLING-COST CHARTS—

A field-level approach to cheaper wells

Drillers have long wanted a quick, simple method to tell them how long they should run a bit and what bit weights and rotary speeds they should use. They can use new drilling-cost charts to get this information. The charts, combined with close examination of the dull bits, show cost and performance on a bit-by-bit basis with full allowance for local conditions.

BY VLADIMIR EDELBERG
Reed Roller Bit Co.

WHEN DO YOU pull a bit that's drilling to run a new one?

What weight on bit and what rotary speed should you use?

Obviously, you want to pull the old bit when the new one would make hole cheaper. You want to use weights and speeds that result in the lowest over-all cost.

These simple facts have given rise to what we call drilling-cost charts. The charts can be an efficient and easily used tool for reducing the expense of drilling. They proceed step by step, accumulating all the costs that arise during a bit run. Then, when the chart shows the old bit beginning to cost more than would a new one, the time has come to pull the pipe and change bits.

Actually, the charts are one part of the two-part approach to the problem. The other element is careful examination of the dull bits as they come out of the hole. By using the charts and examining his dull bits, the driller has a sound and flexible basis for evaluating the bit weight, rotary speed, and hydraulics he has been using. He can more easily see if he should increase or decrease bit weight, if he should speed up or slow down the rotary, and if he has enough bottom-hole cleaning in his hydraulics program.

The approach is based solely on local performance and local conditions. Each bit run is considered individually. Thus, the driller can quickly compensate for unexpected formation changes, for the possibility of a fishing job, and for other factors that apply only to the well or area he is drilling.

Drilling-cost charts have been used in drilling wells in a number of areas, both in the United States and in South America. They have helped make important cuts in cost.

One depends on other. The driller must choose values for a large number of things, each of which affects cost of the hole. The problem is complicated because these things all are interrelated. There has been a lot of analytical work to determine the best relationship between the controllable drilling parameters:

Weight on bit
Speed of rotation
Penetration rate
Hydraulic horsepower at bit

As a result, drilling parameters can now be chosen in a more or less scientific way. Still, most of the analytical methods are based on statistical data derived from average conditions. No one can guarantee that for each particular situation some different approach might not cut cost. Besides, a very important factor is completely missing from the analytical methods. I refer to the fact that fishing jobs are more likely with some drilling practices than with others.

We recognize the great usefulness of the statistical methods of approach to the "choice problem." But, likely, the best many times is practical study of local conditions by the operator himself.

Basic principles. Assume a rock bit is lowered in the hole and starts drilling. Under a given drilling program this bit will drill at a certain rate. This rate will tend to slow down even in homogeneous formations because the rock bit becomes dull. The cost of the footage drilled by the bit **at any moment during its run** is the total cost of three factors: bit cost, round-trip time, and rotating time. All these can be expressed in rig-hours:

$$\text{Cost (rig-hours)} = \frac{\text{bit cost (\$)}}{\text{rig cost per hour}} + \text{round-trip (hours) time} + \text{rotating time (hours)}$$

$$\text{Cost per foot (dollars)} = \frac{\text{cost (rig hours} \times \text{rig cost per hour}}{\text{footage drilled by bit}}$$

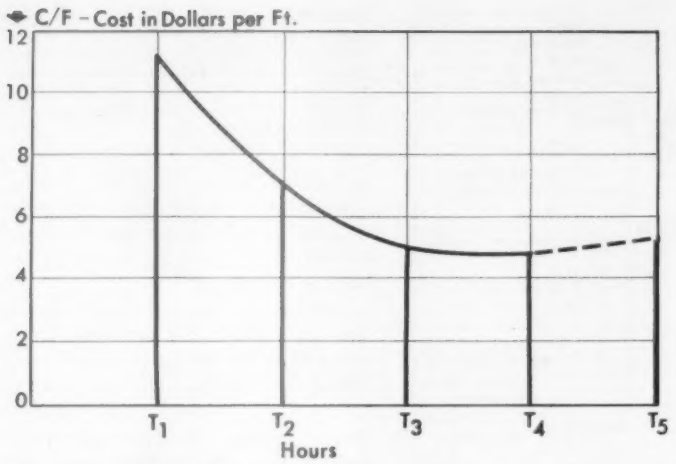
The problem is to pull the bit when the cost per foot reaches a minimum.

Look at the drilling-cost curve in Fig. 1. It plots cost per foot versus rotating hours and shows cost per foot for a given bit if it were pulled at any specific time during the interval plotted.

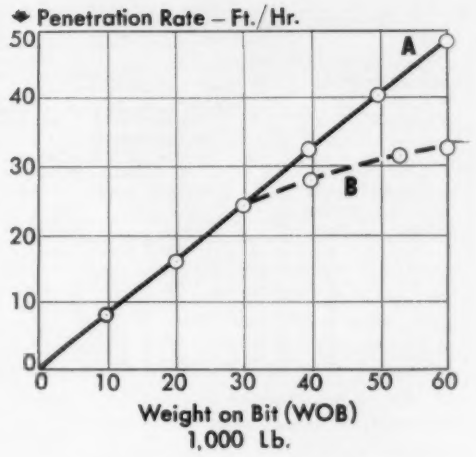
If the bit is pulled after a relatively short interval of time T_1, cost per foot has decreased considerably, but the slope of the curve is downward, indicating that cost can likely be cut even further if the bit is left in the hole longer.

At time T_3 the slope of the curve is approaching 0, and there is little chance of lowering cost per foot appreciably beyond this point. At this point the bit should be pulled if your experience warns that leaving it in longer will cause a disproportionate chance of a fishing job or other trouble. If there is little likelihood of trouble arising from drilling longer with the bit in question, by all means it should be left in the hole as long as cost per foot is decreasing even a very small amount.

At time T_4, cost per foot has reached a minimum and nothing more can be saved by leaving the bit on bottom longer. Indeed, there



COST PER FOOT FALLS for a time after the new bit is run into the hole. Then cost per foot actually begins to rise again. Here, the bit should be pulled and a new one run. Fig. 1.



TEST OF HYDRAULICS determines drilling rate as function of weight on bit. If plot is straight, hydraulic horsepower is sufficient. If plot falls off as dotted line B, bottom of the hole isn't being kept clean. Fig. 2.

is a distinct possibility that the cost per foot will start to increase beyond this point and make the hole cost more than otherwise.

Practical application. Here is the general procedure for arriving at optimum performance:

1. Choose initial drilling conditions.
2. Run the bit under those conditions, and using a cost chart, pull the bit when the chart indicates cost per foot has reached the minimum.
3. Evaluate the condition of the dull bit and make whatever changes are indicated for the next run in similar formations.

Choosing initial conditions. There is the problem of choosing bit type, weight, speed, and hydraulics each of which has a bearing on cost of drilling. The operator must use his own judgment and experience with local conditions to make his initial choice of these things. He can, however, check the hydraulic program and the projected bit weight to see:

1. If the hydraulic power available on the rig is used to best advantage according to good hydraulic principles.
2. If all available weight is used up to, but not past, the point where the available hydraulic power will not adequately scavenge the bottom and clean the hole. Or, all weight should be used that is within the range of safe drilling practices.

To check the hydraulic program, make the following test at the start of each run: Apply various bit weights up to what you consider the maximum safe weight that can be run. Check the rate of penetration at each weight, while maintaining the rotary speed to be used during the run. Plot the rate of penetration versus bit weight as shown in Fig. 2.

If the rate-of-penetration plot is a relatively straight line, as solid line A-A, and does not fall off sharply as dotted line B-B, we can conclude that the hydraulic horsepower is adequate.

If rate of penetration is not linear throughout the range checked but falls off as does dotted line B-B, bottom-hole cleaning is inadequate or the bit is balling. Then, hydraulic horsepower must be raised. If this is not possible, the bit should be run at lighter weight or slower speed because bit wear is faster at the higher weights or speeds and this wear is not counterbalanced by better bit performance.

The choice of r.p.m. depends largely on local conditions. In general, however, the softer the formation the faster the r.p.m., and conversely, the harder the formation, the slower the r.p.m.

Plotting the charts. Fig. 3 is an example of the drilling-cost chart and how it should be filled out. In this sample we assume rig cost to be $100 per hour. We find the "bit value" by taking bit cost (in this case $200) and dividing it by the rig cost of $100 per hour. This gives a bit value of 2 hours, which we insert in the top block of column 3 (total cost in accumulated hours).

Next, we insert the round-trip time in the block above column 2 (in this case 3 hours). The trip time should be an average trip time for our specific rig from the given depth. Trip time should not include any unusual delays (such as extensive repairs) which might be misleading when interpreting the results. Add the trip time to the bit value and enter the total (5) in column 3.

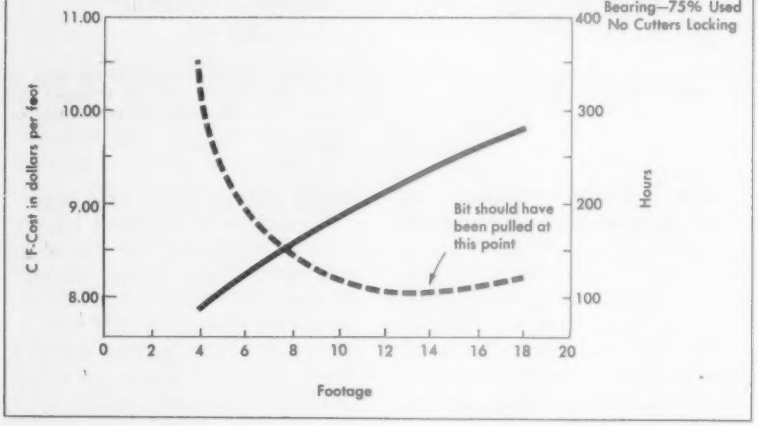
After drilling commences, we need to record interval rotating hours (column 2) only two or three times during the first half of the anticipated run. It should be done more often during the last half of the run. (The interval rotating hours should include connection time, which is normally charged to a bit run.) A little experience will quickly show good time intervals by properly evaluating the bit run.

Enter each specific time interval in column 2. Enter cumulative rotating hours in column 1 and the total cost in accumulated hours (which includes bit value and trip time) in column 3. At any time logged, the figure in column 3 is total cost (in rig hours) of the footage drilled with the bit (the same as given by Equation 1).

Total cost of the footage drilled by the bit shows in column 4 (obtained by multiplying column 3 by the rig cost per hour, in this example, $100).

In column 5 enter the total foot-

Cost of bit divided by hourly rig cost equals		No. 3 Total Cost in accumulated hours	Rig Cost Per Hour $100	Bit Run: EXAMPLE	Type: YHW; Size: 8¾ in.; Serial No.:; Jets:	Date:; Depth out:; Depth in:; Footage: 280; Hours: 18		
BIT VALUE (hrs.) 2		2	No. 4 Rig Cost Per Hour X Accumulated Hours	No. 5 Footage Drilled Accumulated	No. 6 C/F Cost Per Ft. of Hole Drilled Col. No. 4 / Col. No. 5	No. 7 Drilling Weight on Bit in 1,000 lb.	No. 8 RPM	Dull Bit Condition Other Remarks
Round Trip Time in Hours 3		5						
No. 1 Accumulated Rotating Hours	No. 2 Interval Rotating Hours							
4	4	9	900	84	10.71	50	60	
8	4	13	1,300	154	8.44	50	60	
10	2	15	1,500	183	8.20	50	60	Optimum Point
12	2	17	1,700	212	8.02	50	60	
14	2	19	1,900	236	8.05	50	60	
16	2	21	2,100	259	8.11	50	60	Teeth-80% Dull Tooth Breakage-Slight
18	2	23	2,300	280	8.21	50	60	Teeth Worn Square Full Gage But Rounded Bearing—75% Used No Cutters Locking



EXAMPLE CASE shows how the drilling-cost charts should be filled out. While curve shows when bit should be pulled, notations about dull-bit conditions are to improve next run by detecting better bit weight and rotary speeds. Fig. 3.

age drilled by the bit in the rotating hours shown in column 1. Column 6 (cost in dollars per foot of hole drilled) is obtained by dividing column 4 by column 5.

Although column 6 clearly shows the approach of the optimum point for pulling the bit, it is well to plot the drilling cost curve (cost per foot, column 6 versus total rotating hours, column 1). This plot helps us visualize the drilling cost and project the potential savings, if any, that might arise from leaving the bit on bottom longer.

The form should be filled in and the curve plotted and evaluated following each interval of rotating hours. Doing so provides us an up-to-the-minute analysis of drilling progress. At the same time the drilling-cost curve is plotted, we should also plot the rate-of-penteration curve (footage drilled by the bit, column 5, versus total rotating hours on the bit, column 1). This curve helps show abrupt changes in formation and helps determine the optimum point at which the bit should be pulled.

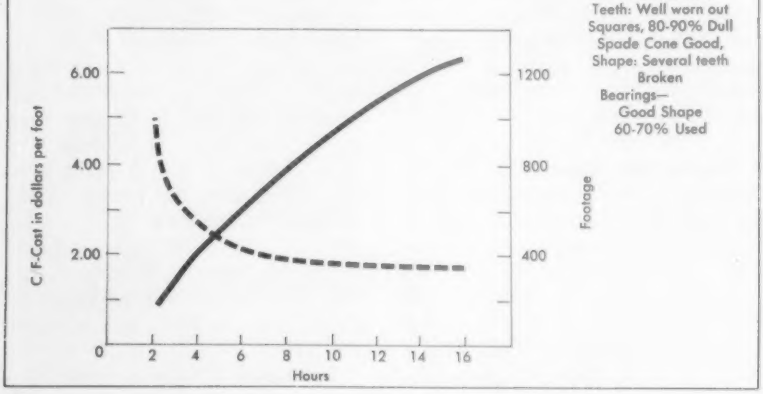
Columns 7 and 8, along with the last column (Dull bit condition . . . other remarks) should certainly be filled in. This information can prove of great value on succeeding runs or on future holes.

Examination of dull bits. When a bit has been pulled, its condition should be described as thoroughly as possible. There is no standard description for dull conditions. However, any experienced driller can generally give a satisfactory description:

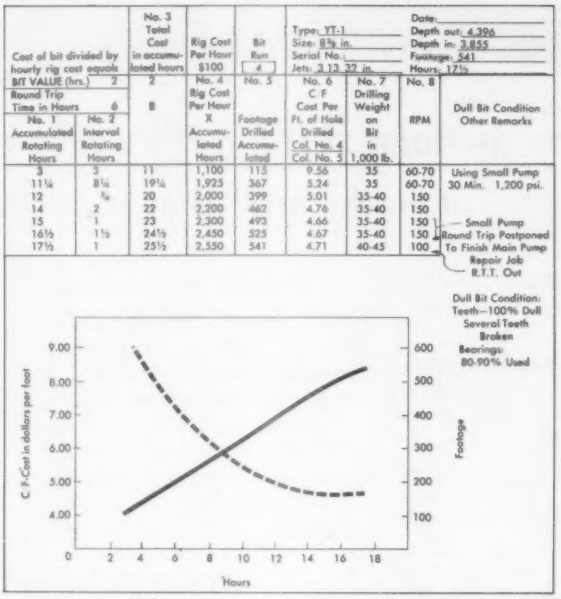
1. Degree of tooth wear . . . use a percentage scale.

2. Type of tooth wear: abrasion from formation being drilled; abrasion from particles in mud system; teeth . . . worn flat, rounded, broken, etc. Particularly note condition of the gage teeth and spade.

Cost of bit divided by hourly rig cost equals		No. 3 Total Cost in accumulated hours	Rig Cost Per Hour $100	Bit Run: 3	Type: YT3; Size: 8⅝ in.; Serial No.:; Jets: 3 13/32 in.	Date:; Depth out: 3,855; Depth in: 2,575; Footage: 1,280; Hours: 16		
BIT VALUE (hrs.) 2		2	No. 4 Rig Cost Per Hour X Accumulated Hours	No. 5 Footage Drilled Accumulated	No. 6 C/F Cost Per Ft. of Hole Drilled Col. No. 4 / Col. No. 5	No. 7 Drilling Weight on Bit in 1,000 lb.	No. 8 RPM	Dull Bit Condition Other Remarks
Round Trip Time in Hours 5		7						
No. 1 Accumulated Rotating Hours	No. 2 Interval Rotating Hours							
2	2	9	900	181	4.97	18-20	150	Pump 60 SPM 1,600 psi.
3½	1½	10½	1,050	370	2.83	18-20	150	Pump 64 SPM 1,900 psi.
6¼	2¾	13¼	1,325	622	2.13	20-22	100	Kelly Starts
10½	4¼	17½	1,750	968	1.81	22-25	100	Vibrating
11¾	1¼	18¾	1,875	1,061	1.77	28-30	100	Shift
12¾	1	19¾	1,975	1,124	1.76	30-35	100	Theoretical
13¾	1	20¾	2,075	1,185	1.75	30-35	100	Optimum Point
15¼	1½	22¼	2,225	1,248	1.78	30-35	100	Laid Down 1 Joint
16	¾	23	2,300	1,280	1.80	30-35	100	Loss 10 ft.



ACTUAL FIELD WELL for a rig drilling in South America. Dull-bit condition shows that type is good one for this formation; also decision to leave the bit on bottom after cost curve had leveled off proved wise. Fig. 4.


Cost of bit divided by hourly rig cost equals BIT VALUE (hrs.) 2
Round Trip Time in Hours 6
No. 1 Accumulated Rotating Hours
No. 2 Interval Rotating Hours
No. 3 Total Cost in accumulated hours
Rig Cost Per Hour $100
Bit Run 4
No. 4 Rig Cost Per Hour X Accumulated Hours
No. 5 Footage Drilled Accumulated
Type: YT-1
Size: 8⅝ in.
Serial No.
Jets: 3 13 32 in.
No. 6 C F Cost Per Ft. of Hole Drilled Col. No. 4 Col. No. 5
No. 7 Drilling Weight on Bit in 1,000 lb.
Date:
Depth out: 4,396
Depth in: 3,855
Footage: 541
Hours: 17½
No. 8 RPM
Dull Bit Condition Other Remarks
3 3 11 1,100 113 9.56 35 60-70 Using Small Pump
11¼ 8¼ 19¼ 1,925 367 5.24 35 60-70 30 Min. 1,200 psi.
12 ¾ 20 2,000 399 5.01 35-40 150
14 2 22 2,200 462 4.76 35-40 150
15 1 23 2,300 493 4.66 35-40 150 — Small Pump
16½ 1½ 24½ 2,450 525 4.67 35-40 150 Round Trip Postponed
17½ 1 25½ 2,550 541 4.71 40-45 100 To Finish Main Pump Repair Job
R.T.T. Out
Dull Bit Condition: Teeth—100% Dull Several Teeth Broken Bearings: 80-90% Used
C F-Cost in dollars per foot
9.00
8.00
7.00
6.00
5.00
4.00
600
500
400
300
200
100
Footage
0 2 4 6 8 10 12 14 16 18
Hours

NEXT RUN of field well shown in Fig. 4. Final cost per foot was $4.71, compared to $1.80 on the previous run. Apparently, there was a change in formations. Driller must be on guard such formation changes don't lead him to pulling a bit prematurely. Fig. 5.

If possible, measure the gage diameter of the bit.

3. Bearing wear, expressed in percentage, is always useful even though it is not precise.

4. Type of bearing wear: balanced; ran in; ran out; pinched, locked, broken journal, etc.

5. Any other pertinent observations, such as washed-out jets, cracks, checks, external scars on bit body, etc.

6. Photographs of bits are very valuable and often compensate for lack of precision in the description of the dull. Photos can be of great value for future studies.

In general, dull bits fall into one of five classifications:

1. **Wear on teeth and bearings fairly advanced.** In general, if a bit is pulled in this condition after what the drilling-cost curve indicates to be the optimum time, the program is well balanced and the drilling parameters chosen wisely.

2. **Wear on teeth and bearings not very advanced.** More weight on bit likely is in order. This might require more drill collars. However, the hydraulic program must also be checked to see that enough horsepower is avaliable at the bit; if not, more should be added where possible. Rotary speed and type of bit must also be investigated.

3. **Teeth green and bearings loose.** This condition might be corrected in numerous ways. The mud must be checked for abrasion, or for chemicals which damage bearings. Desanders, addition of oil, or possibly corrosion inhibitors might be called for. Also, slower rotary speed and higher bit weight should be investigated to try for better balance between tooth and bearing life. Perhaps a softer bit type should be tried.

4. **Teeth dull and bearings tight.** Here it is necessary to examine the bull in more detail. If tooth breakage is excessive, less bit weight or slower rotary speed or both might be in order. Or perhaps a harder-type bit is necessary. Remember, however, some tooth breakage is often normal even with the correct bit type and when drilling conditions are optimum. So, we must be careful to avoid unwarranted changes in procedure. If tooth wear is heavy in harder-type bit, perhaps an insert type bit is needed.

5. **Bearings lock before drilling-cost-chart method indicates optimum time to pull the bit.** In this case the bit weight and rotary speed may be too high. We should try less of either or both, checking closely using the drilling-cost-chart method to see if cost per foot goes down.

Not only do the drilling-cost charts permit us to evaluate drilling practices, but together with dull-bit descriptions, they open up new approaches to cutting cost.

After one hole has been completed in an area, the program can be modified. The new cost per foot figures in identical sections can be compared so that additional changes can be made and evaluated.

A field case. Here is a case of an actual bit run on a rig drilling in a proven field in South America. Rig cost was $100 per hour.

Fig. 4 is for run No. 3, an 8⅝-in. YT3 bit with three 13/32-in. jets. It drilled 1,272 ft. in 16 rotating hours.

The dull-bit condition . . . teeth 80-90% worn out, bearings 60-70% used up, indicates the long-tooth YT3 to be the correct type for the hydraulics and weight available. The dull condition also shows that the decision to run the bit beyond the theoretical optimum point was a sound one.

Note on the cost per foot curve that the theoretical optimum point was at the end of 13¾ rotating hours. Between 11¾ and 12¾ hours, cost per foot fell only $0.03 even though bit weight went up an average of 5,000 lb. Between 12¾ and 13¾ hours, cost per foot fell only $0.01 with the same weight as in the preceding interval. The slow change in the slope of the rate-of-penetration curve indicates a natural dulling tendency during these intervals.

On the other hand, the rather abrupt change from 13¾ to 15¼ indicates a probable formation change. As a result the bit could be left in the hole longer even though cost per foot tended to go up.

In Fig. 5, run No. 4, the change to a harder-type bit was indicated, but the rate of penetration and ultimate dull condition of the YT1 indicate an even harder bit type, such as the YTL, might have been used to advantage. This bit was run beyond the most economical point of pump repairs, as explained on the chart.

Note that average cost per foot for bit No. 3 was $1.80. For bit No. 4 it was $4.71. This warns us that we can be misled if we try to compare performance on run No. 3 with run No. 4. Formations sometimes change greatly from bit to bit. When they do the charts show a big difference in the cost per foot of hole drilled on different bits.

Bibliography

H. B. Woods, "Analysis of Rock-Bit Performance Data": World Oil, September 1951.

John W. Speer, "How to Get the Most Hole for Your Money," The Oil and Gas Journal, March 31, and April 7, 1958.

How to simplify oil-field automation

. . . by applying the modular system. Here's how it works and what it costs

BY HUGO SHANE
General Controls Co., Los Angeles

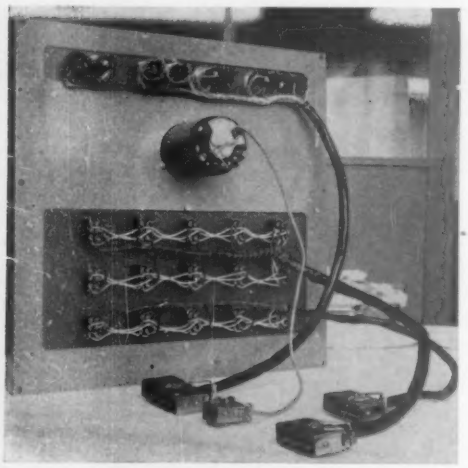
HOW AUTOMATIC should we get?

Opinions vary. Some operators feel that motorizing of valves and the use of time clocks for stop-cocking is enough. Others believe that automation must be completely centralized from the standpoint of operation and data accumulation.

The first of these thoughts does nothing to reduce operating costs and increase accuracy. The second involves great expense and yet leaves much to be desired as far as accuracy is concerned.

Development of new equipment built along modular lines has done much to reduce the cost of automation, and to make it feasible for small leases.

Factors affecting automation. Oil-field automation involves problems not faced by other industries; remote location, unreliable power sources, extremes of temperature and humidity, contaminated atmospheres, and prorated income that makes funds available for automatic control fairly limited.



MODULAR ARRANGEMENT of various units in the automatic system is made possible by plug-in type equipment as shown here.

Savings must be based on manpower reduction or protection against product loss. There is no benefit from increased productivity. Operating personnel may be unfamiliar with automatic controls, and highly trained personnel could be as distant as a day's travel.

Equipment, then, must be reliable, provide for manual overriding controls, and be easily repaired.

Data collection can involve as many as eight functions of five or six digits each. Some data must be cleared on readout, others accumulate.

Control and data-collection functions. The speed of switching is relatively unimportant since the valves they are controlling usually have an operational time of more than 1 second. Frequently valve operating time is purposely delayed to prevent flooding of separators, storage tanks, etc. Valve control is used for shutting in wells, diversion of flow from bulk to test lines, selection of meter-run or production separators where both high and low-pressure wells are operated on the same battery, etc.

Data accumulation is also of a slow-speed nature with readout required only once every 4 to 24 hours. Some of the data needed are: oil produced or shipped, gas or water injected, test time, and oil, water, and gas volumes.

In addition to control and data-collection functions, alarm signals must often be given to insure continuous production, and show equipment failure or hazardous conditions. It is felt that this last function is the crux of acceptance of automation. If manpower effectiveness is to be increased, the operator must be informed continuously of proper operation in all fields under his responsibility.

Simplicity vs. Complexity

The introduction of LACT resulted in some oil companies going from **no** automatic control to **automation for automation's sake.**

Control equipment must be matched to the peculiarities of the installation and have realistic cost ratios. This done, it can permit a single attendent to operate as many as 30 batteries of up to 50 wells each. A roving crew can then handle the preventive maintenance.

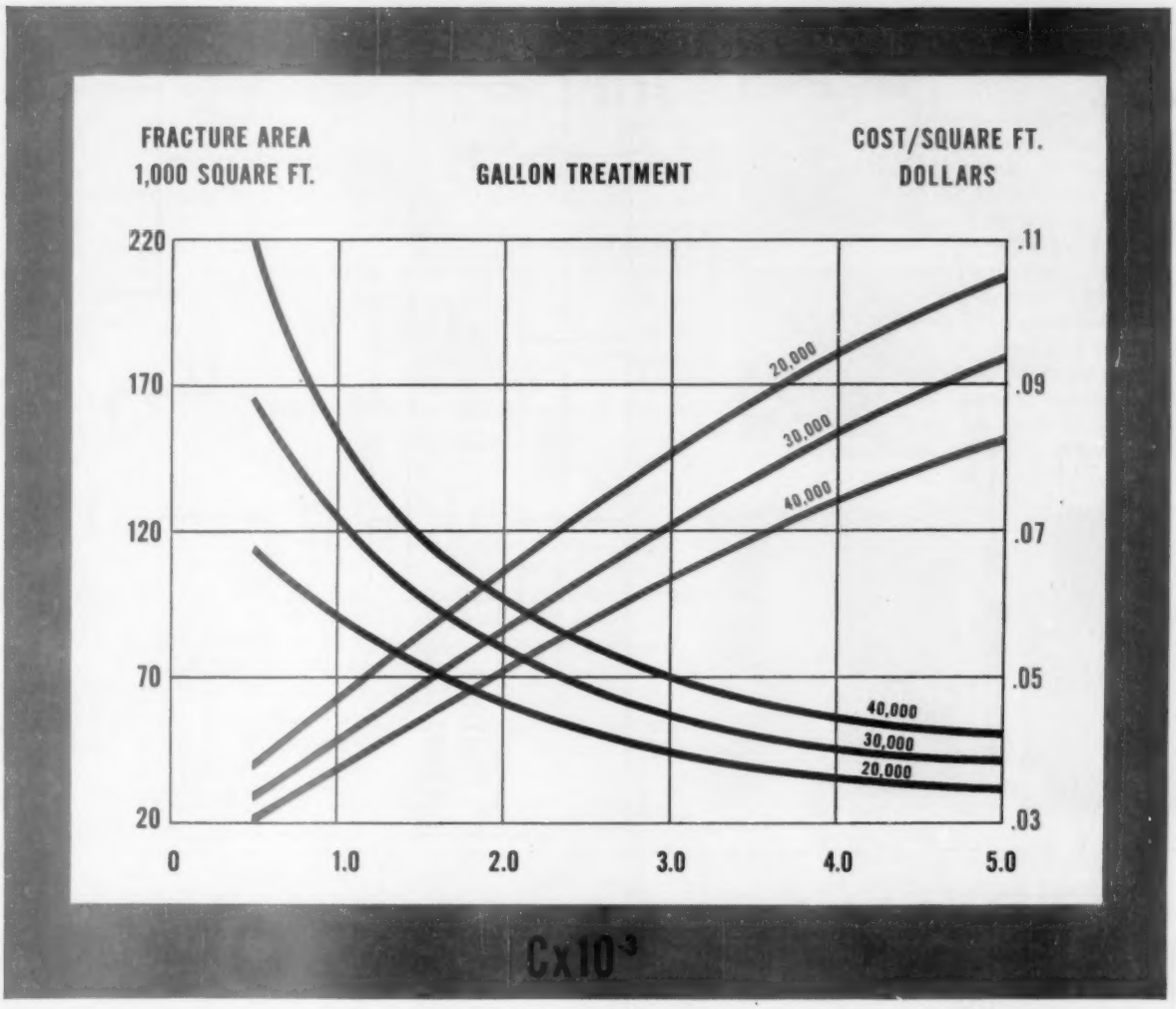
Automation can accumulate data in a form capable of transmission to a central point and ready for insertion into existing computer equipment. This equipment can then provide automatic royalty payments, reservoir-engineering data, proration reports, etc. Thus, data can flow on a preprogramed schedule directly from the field to the computer to management, or back to the production personnel.

The equipment can provide automatic control for usual conditions, and overriding manual control for the unusual. Production personnel need not go to the field unless told to by the warning devices, or for preventive-maintainance purposes.

Design considerations. What should we expect of automation and automatic equipment?

Automation should provide: (1) Increased coverage of field personnel, (2) reduction of supporting clerical personnel, (3) improved accuracy of required data, and (4) field data readily available to management personnel.

To obtain these advantages the equipment must (1) provide for slow-speed on-off switching, (2) provide for slow-speed data accumulation, (3) transmit accumulated data to a centrally located station, (4) present these data in a form that can be readily fed into existing computer equipment, and (5) provide for warning of equipment or power failure.



Choose ADOMITE additives for efficient fracturing

Perhaps the most important consideration in any frac job is the fluid-loss coefficient, C, of the fracturing fluid. As a direct measure of fluid loss, it is inversely related to the efficiency of the oil. A low C value means more fracture area with lower costs per square foot. Most refined frac oils will give a C value of 5.0×10^{-3} and higher. Coefficients of 1.0×10^{-3} or lower are commonly obtained with ADOMITE fluid-loss additives.

The importance of a low C factor is readily apparent from a study of the graph. It shows a number of typical situations with a pump rate of 30 BPM.

For example, a 40,000 gallon job with a C factor of 1.0×10^{-3} will result in a fracture area twice the area of a treatment run with a C factor of 3.0×10^{-3}. The higher fracture area means substantial reductions in cost per square foot... the only *true* measure of efficiency!

For additional information or copies of the nomographs used for calculations of fracture design, contact your nearest ADOMITE representative:

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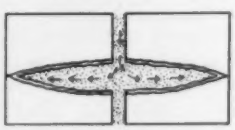
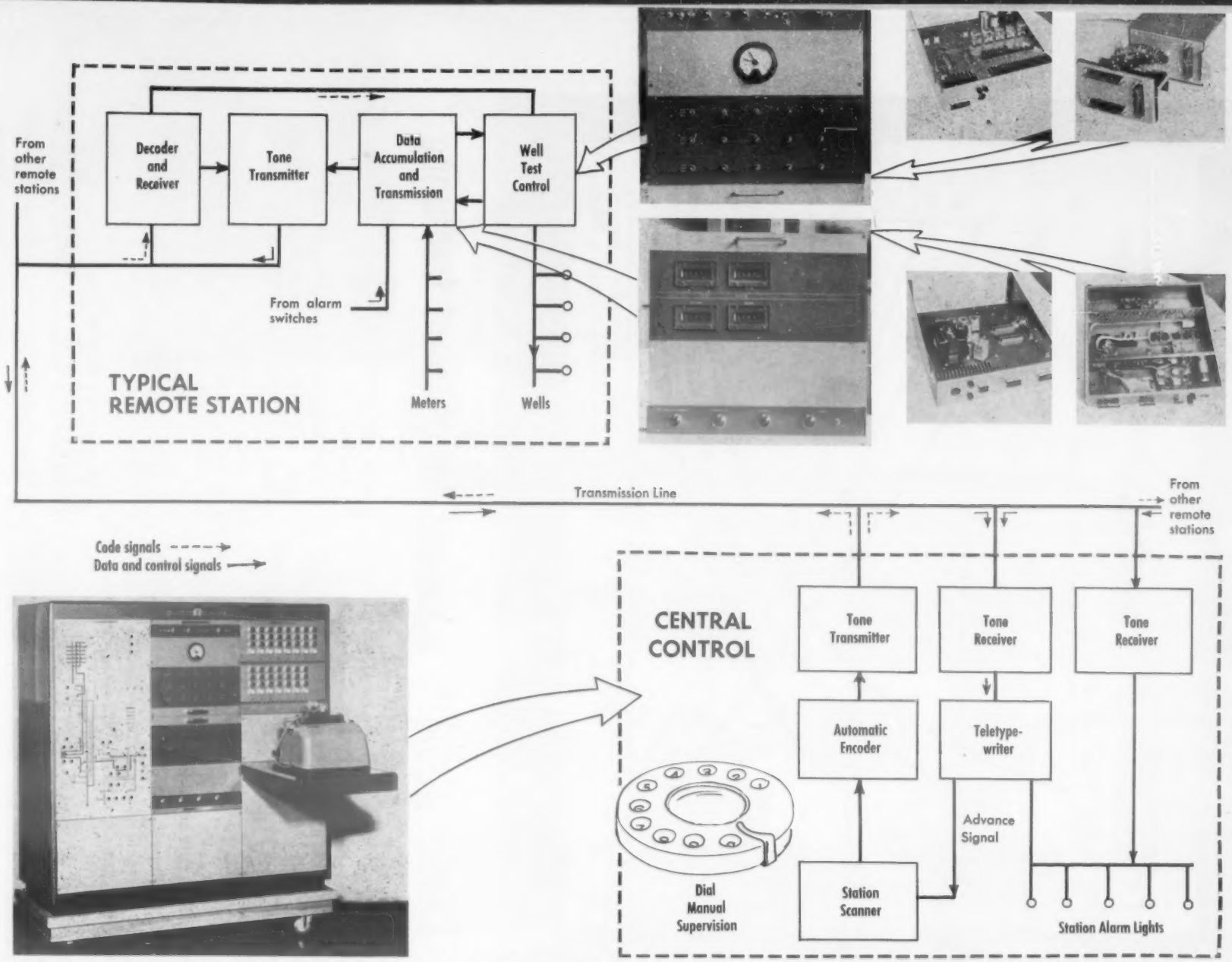


"30,000 frac jobs can't be wrong!"



SMALL UNITS PLUG TOGETHER to make big ones which in turn are used as a part of a complete automatic system capable of handling several tank batteries with a minimum of supervision. This diagram of a typical installation shows only one of several possible remote stations, and the central-control facility.

In accomplishing these functions and considering the factors of installation, this equipment must (1) have simplicity of design, (2) have high reliability with unreliable power supplies, (3) be easy to install and repair, (4) be low in cost, (5) be flexible in design permitting application to all types of meters or valves, (6) be expansible without extensive field wiring, (7) use readily available parts, and (8) capable of withstanding varying ambient conditions.

Selection of design approach. Considering simplicity, low cost, slow-speed switching, and varying power source, the selection of a basically electro-mechanical circuit design is indicated.

The relay has provided years of low-cost trouble-free service in millions of applications and is unaffected by current variations as great as 25%. It can handle extremes in temperature and humidity, and can be sealed against contaminated atmospheres. It can be obtained as a plug-in package permitting simple replacement in case of failure.

Sequential functions are readily handled by multiple position relays, and relay operation is easily understood. Switching functions then appear to be best handled by low-cost relays of a plug-in design.

Data accumulation is of a slow-speed nature but involves a considerable number of digits. The lowest-cost, high-capacity storage device available today is the electrical-pulse counter. These counters are available with readout switches to permit automatic printout of stored data. Any other method would cost twice as much.

Transmission of data must provide the highest reliability under conditions where the means of transmission (telephone line) is unreliable. Further, it must be in a universal language that can be used in computing equipment. Since continuous transmission is doubtful, data accumulation should be handled on a local basis, with line checking before transmission.

The simplest and lowest-cost method of doing this is the use of a central receiving station sending a trial code to the transmitter before actual transmission takes place. To eliminate the effects of parallel electrical lines or storms, a simple audio tone signaling system can be used.

The only universal code language used today in the transmission of data is the teletype code. Although slow in speed, it can handle all data functions as well as alarm signals at modest cost. Equipment is available to convert its tape output into any computer language.

Signal transmission from remote areas involves the possibility of line interference. This eliminates the use of direct-current signaling. The most common and lowest-cost method of handling transmission of this nature is the audiotone signaling system.

One limitation is the number of tones possible on a single line. So a method must be devised to keep the number of tones to a minimum, such as a selective dialing technique which can be used from the central control to the remote stations to activate the tone generators. In this way a single frequency can be used to handle all data. This method provides the line-check technique discussed above prior to the transmission of data. The remote station must receive the calling code prior to transmission of data.

Use of the dialing technique affords us another necessary function—supervisory control. Several codes can be used for a single remote station. Each code can have a receiving relay to perform several switching functions. For instance, a code can be set up to end a test out of sequence, to request an interim report of test or production data, to shut in a lease, and so on. Standard low-cost encoding and decoding packages have been used for years in the selective coding of mobile telephone units.

In installations where no data are to be transmitted, the audio tone signaling system can be used to indicate power failure, equipment failure, and transmission-line failure. This is accomplished with a series of normally closed alarm switches energizing the audio tone generators in the field. The receiver at the central station drives a relay which, in turn, operates an alarm light on the deenergizing. It can be seen that any of the failures described above will cause the alarm light to be lit.

Although the basic switch circuitry can be designed with the use of relays, there are many single function switching requirements (such as data encoding) which can be handled at lower cost using diodes. Since voltage fluctuation is a problem, diode selection should be based on high safety factors. The ratio of cost between relays and diodes is six to one.

It is possible to select equipment protected against corrosive atmospheres. But the increased cost ratio would be on the order of four to one, since even the wiring is attacked by the gas. It is more practical to use standard components enclosed in an airtight enclosure with a continuous bleed of inert gas into the cabinet.

Selection of equipment for a particular installation is dependent on the number of wells that can be centralized into a single battery. In all cases, however, an alarm signaling system should be included to signal any failure that would reduce production or cause damage.

It is felt that, for fewer than five wells, local printout should be used; for over five wells, remote printout can be justified.

Supervisory control is expensive and, therefore, should be used sparingly. In too many cases the request for supervisory control is based on present operating rather than automatic methods. The problem of varying test time, erratic production, etc., can be handled with two or three supervisory control functions without undue increase in cost or complication of circuitry. Complication naturally decreases the reliability of the equipment and the ease of maintenance.

Modular system. To meet the requirements of all production problems, a modular arrangement of automatic equipment has been developed. These units are self-contained and can be removed individually for repair or replacement, resulting in reduced maintenance costs.

Brief descriptions of the needed units follow:

- **Well-test controller** provides for automatic sequence testing of wells by operating valves in the well-test manifold. A clock can be preset to regulate the length of the test.

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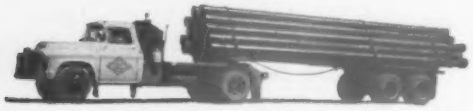

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• **Parallel printer readout** accumulates test and production flow data and automatically records these data on a continuous basis.

• **Data accumulator and transmitter control** is a remote readout unit that provides storage of test and production flow data and a means of encoding and transmitting these data using standard teletype techniques.

• **Data-receiving central** provides for automatic scanning of remote well test, data accumulation, and transmission stations to permit printout of test, production, or alarm data.

• **Lease or remote station coding control** provides the use of a single audio tone for transmitting data from the field to the data-control central. This can be done by an automatic multichannel code sender at the central and single channel decoders at each station.

• **Tone-generating data-transmission system** consists of a transmitter at each lease with a single receiver at the data-receiving central.

• **Supervisory control circuit** is used to provide local control of a remote station. Normal routine can be interrupted, a well can be shut in, and other supervisory operations performed from a master control panel. All this is accomplished by use of a telephone-type dial on the master control panel.

• **Flow status control** reports any or all valve positions in the automatic system.

• **Alarm signaling system** provides for single or multiple alarm signaling where local readout only is used and where no teletype encoding is available, as on a small lease.

Typical System

Let's look at a hypothetical example.

Assume eight batteries are located in fields within a 30-mile circumference. Of these, 6 have from 12 to 16 wells in a centralized battery. Two of the stations are located side by side, and two contain only three wells each. Electrical power is available at each battery. The installation is located in a state where production is prorated.

The two small stations should contain a simplified well-test con-

troller with local line printers plus a single alarm signaling system actuated by three no-flow indication switches and one high-level switch in series. The well-test control alarm switch should be tied to a high-level switch in the test treater or separator so that testing will be suspended when this condition occurs.

Five control packages will take care of the remaining six stations, each capable of handling a total of 16 wells. The 16 well number is selected so that all stepping switches are interchangable, reducing the number of spare parts required.

One control will operate the two batteries located side by side. This unit will contain a single 16-well, well-test control, with data accumulator and transmitter capable of storing a common test time for both batteries, but individual accumulators for gas, oil, and water flows. Each station should contain additional storage of LACT or production flow.

Each of the five major transmitter panels should contain a single alarm circuit actuated by similar switches to those listed for the smaller stations.

A single central control panel consisting of a data central scanner for five stations, a tone receiver, an automatic code sender, and a supervisory control dial for ending a test at any of the leases is recommended.

It is assumed that a clock-actuated control will be provided to handle the problem of proration. The time clocks and well-test control should be so programed that each well in the group will have an opportunity to be placed on test before the allowable has been produced.

At the end of the test the data accumulators on the major leases are placed in a ready-to-transmit condition and await a signal from the data center to report its information. On a signal from the central this information is transmitted and reproduced on the center's teletype machine. After transmission, the well-test control selects the next well for testing.

Meanwhile, the data center has gone on to the next station to request information. If a test is not complete each transmitter will send a code indicating that it is on test and to show that the circuit is intact and all functions are being per-

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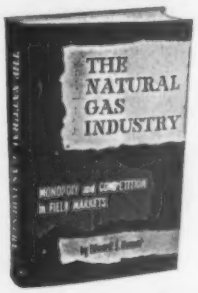

The Natural Gas Industry

Monopoly and Competition in Field Markets

BY EDWARD J. NEUNER

Is there a gas industry monopoly in field markets . . . or isn't there? Is it really necessary for prices to be regulated by the federal government?

Here is a detailed, impartial investigation of the most controversial public economic policy of our times . . . the requisite factual and analytical foundation upon which a rational decision could be made . . . for all who are concerned with the details of natural gas production and its regulation, control, and resulting price to customers.

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formed properly. On receipt of this signal, the data center continues to the next station, etc.

The local printout station, on the conclusion of each test, signals its printer that a test is complete. The printer prints the flow data and signals the well-test control to go on to the next test.

Should a hazardous condition arise at any of the stations, it will be signaled through the use of the simple audio tone system, in the case of the small stations, or be transmitted on the next call from the central in the case of the larger stations.

The operator at the central station is now in a position to receive test and production data and observe any malfunctions. Should an irregular test report be received, the operator can dial the station involved, end the test in progress and place the particular well on test again. He can request interim reports of this test by merely calling the station again. In the event of a hazardous malfunction, he can call the roving maintenance crew.

As the characteristics of the wells change, their sequence can be changed by simply switching the diversion valve connection on the well-test terminal board. In this way wells of similar characteristics are tested in one time period.

Note that all normal control is handled on a local basis. Transmission-line failure does not affect the field operation. If power failure in the field causes shutdown and suspension of test, the data are left intact.

Summary

This article has discussed automatic control and data accumulation equipment only. We have left the discussion of the mechanical equipment such as valves, meters, and separators, to others.

Cost of equipment is dependent on the number of wells operated per station. In the example above the complete system can be installed for a little more than $500 per well. Were the number of wells at each station increased to 30, the cost per well would reduce to approximately $270. Under normal conditions it appears that a 2-year payout can be made without consideration of the advantages in more prompt and accurate field data.

Cost of refinery obsolescence

BY W. L. NELSON, Technical Editor and Petroleum Consultant

THE LOSS by the obsolescence of processes which have not been completely depreciated is indicated in Table 1. A useful life of 20 years was used and the percentage of undepreciated life was estimated for each type of process. The fact that all of the equipment of the obsolete process need not be discarded was also taken into account as well as the fact that certain segments of the industry (notably lubricating-oil manufacture) may have been affected more severely than other parts of the industry. The cumulative effect of all of these factors permitted an estimate of the percentage of a barrel of crude oil that is affected by the changes. Finally, by means of the per barrel cost of the obsolete process and the replacement cost of refineries at that date, it was possible to state the cost of obsolescence as a percentage per year of the replacement cost of the refinery. Obsolescence costs average about 2% per year of investment in light-oil (or fuel) refineries, whereas the cost for lubricating-oil refineries is nearer 1% per year. Note, however, that the investment cost of lubricating-oil refineries is more than double that of light-oil refineries, and thus the dollar cost of obsolescence for lube refineries is proportionally larger.

Process Costimating No. 76, July 25, 1960, p. 204, listed the 116 changes that have occurred in the industry since 1860. Of these, 19 clearly caused a significant loss by obsolescence and the 19 changes are the ones examined in Table 1 here. The rate at which all changes have occurred and at which obsolescence—causing changes have occurred, was indicated in Process Costimating No. 86 of January 2, 1961, p. 86, and No. 88, February 6, 1961, p. 109.

Improvements require large capital expenditures, even though obsolescence is not involved, and these costs were discussed in Process Costimating No. 90, March 6, 1961, p. 143.

Table 1—Obsolescence Cost Summarized Since 1910 as Per Cent Per Year of Refining Replacement Cost

Year*	Innovation	Replaces	Obsolescence§ % not depreciated	Equipment discarded,† per cent	Per cent of crude oil processed L. O.	Per cent of crude oil processed Lube	Equivalent percentage of crude oil affected L. O.	Equivalent percentage of crude oil affected Lube	Cost of discarded process $ per bbl.	Cost of new refinery $ per bbl. L. O.	Cost of new refinery $ per bbl. Lube	Cost of obsolescence $ per bbl. crude oil L. O.	Cost of obsolescence $ per bbl. crude oil Lube	Obsolescence cost, % per year of new refinery cost L. O.	Obsolescence cost, % per year of new refinery cost Lube
L1915	Percolation	Acid treatment (1880)	30	50	..	25	...	3.75	$11.60	....	$530	....	0.44	....	0.08
L1922	Centrifuge	Cold settling (1900)	50	40	..	20	...	4.00	156.00	....	740	....	6.16	....	0.83
D1925	Steam plant	Boilers (1900)	50	75	75	50	26.2	18.80	‡1.03	$290	690	32.60	97.00	11.30	14.00
D1925	Reactor cracking	Burton stills (1915)	75	75	35	15	21.0	9.0	290.00	290	690	61.00	26.10	21.00	3.78
		Jenkins, etc. (1920)	85	75	...	..	...	....							
D1930	Pipe stills	Batteries (1915)	60	75	100	100	45.0	45.0	73.00	280	580	32.90	32.90	11.75	5.68
L1930	Vacuum stills	Steam stills (1912)	50	80	...	50	...	20.0	87.50	....	580	....	17.50	....	3.02
		Acid treating (1912)													
T1932	Gum inhibitors	Acid and rerun (1915)	55	90	15	10	7.4	4.95	35.80	....	....	....	....	....	....
		Gray vapor phase (1930)	95	75	10	5	7.1	3.56	17.90	265	550	3.92	2.41	1.48	0.44
D1932	Delayed coking	Coking stills (1910)	50	85	5	3	2.1	1.28	107.00	265	550	2.27	1.36	0.86	0.25
L1933	Extraction	Acid and clay (1912)	45	50	...	30	...	6.75	28.40	....	530	....	1.92	....	0.36
G1935	Cat poly	Thermal poly (1932)	90	50	2	1	0.9	0.45	436.00	260	530	3.93	1.96	1.51	0.37
G1935	Propane	Stabilizer (1930)	85	50	1	1	0.4	0.42	70.30	260	530	0.30	0.30	0.12	0.06
L1935	Solv. dewax.	Centrifuge (1922)	40	70	...	25	...	7.00	703.00	....	530	....	49.20	....	9.30
		Presses (1891)													
D1935	Cracking	Reactor cracking (1927)	80	65	50	25	26.0	13.00	211.00	260	530	55.00	27.50	21.20	5.20
L1945	Deoiling	Sweating (1891)	10	80	...	4	...	0.32	93.20	....	780	....	2.98	....	0.38
D1945	Cat cracking	Thermal cracking (1935)	75	20	50	25	7.5	3.75	163.00	390	780	12.20	6.10	3.12	0.78
D1952	Reforming	Thermal reforming (1930)	50	50	15	10	3.8	2.50	245.00	690	1,410	9.17	6.12	1.33	0.44
L1955	Continuous wax molding	Gray wax press (1891)	10	80	...	3	...	0.24	292.00	....	1,620	....	0.70	....	0.04
G1955	Alkylation	Polymerization (1935)	50	70	3	2	1.0	0.70	860.00	800	1,620	9.00	6.00	1.13	0.37
T1956	Inhibitor sweet	Other sweetening (1925)	35	90	20	10	6.3	3.15	62.80	850	1,720	3.95	1.98	0.46	0.12
										Total for 37 years				75.26	....
										Total for 42 years				....	45.50

*Year at which process finds widespread use. After the change is affected the cost becomes part of the investment in new refinery capacity. The letters refer to processing operations, as—L, lube; D, distillation; T, treating; and G, gas recovery or conversion. †Some equipment is utilized in the new process but also some older equipment is not discarded or replaced. ‡Dollars investment per pound per hour of steam. §Based on depreciation in 20 years.

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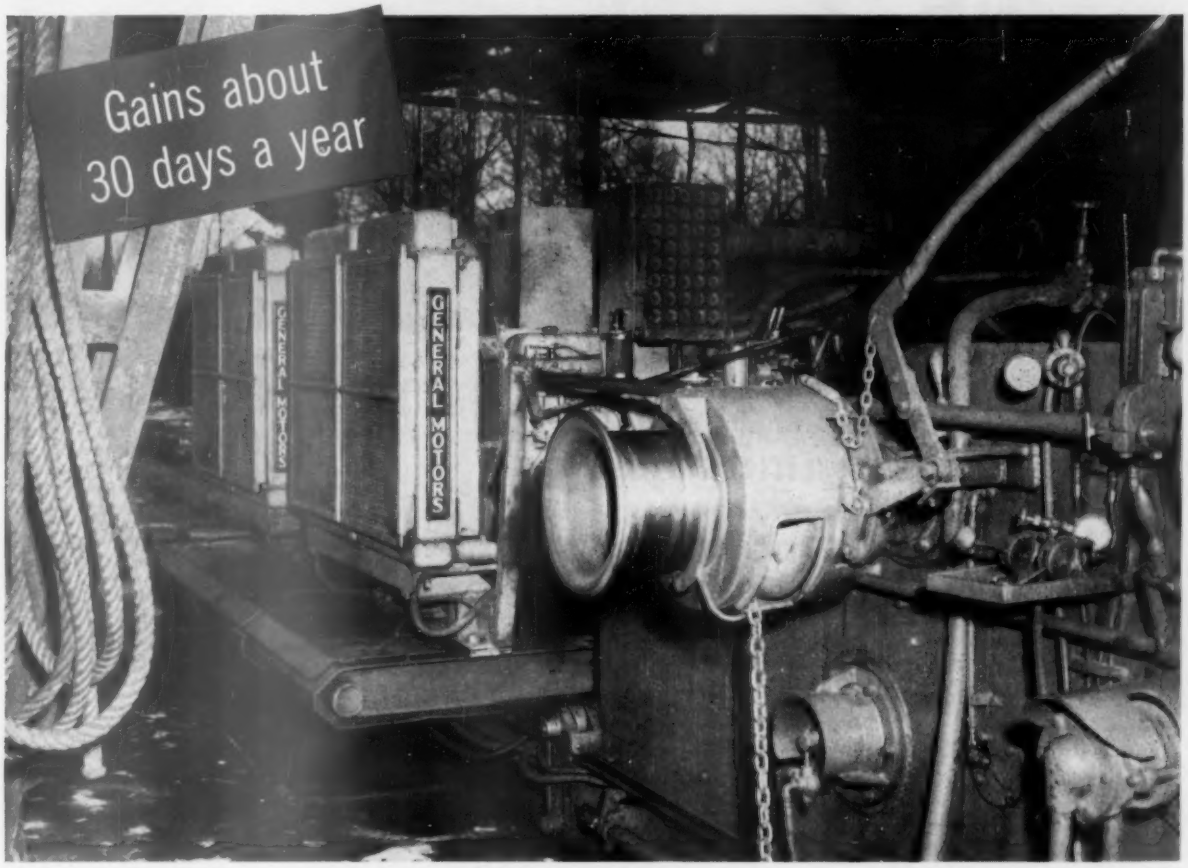

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WORLD'S LARGEST PIPE STILL under construction at the Texas City refinery, looking northwest with No. 2 cat cracker in right background and No. 1 cat cracker left background. Three vessels that rise at the left are vapor-recovery section of pipe still, two horizontal vessels left foreground are crude desalters, and tall vessel behind them is crude tower. Steel framework at right is for furnaces. Behind them is the largest vessel in diameter, the vacuum tower.

Progress Report from Texas City

Three modern units rising to replace six outmoded ones

BY H. C. BOZEMAN
Gulf Coast Refining Editor

A MODERNIZATION program is forging rapidly ahead at American Oil Co.'s Texas City, Tex., refinery. It centers around three new units to replace six outmoded units.

The new units are a 150,000-bbl.-daily crude pipe still, the world's largest; a 47,600-bbl.-daily fresh-feed fluid catalytic cracker, and a 14,600-bbl.-daily alkylation unit, largest of its kind.

With construction well under way, American Oil plans startup operations for all three units by year end.

Prime contractor for the pipe still and catalytic cracker is M. W. Kellogg Co. which started preliminary site work in October 1960. Alkylation-unit prime contractor is Fluor Corp., Ltd., which started preliminary site work in December 1960.

Crude running capacity will not increase very much after construction, only about 10,000 bbl. daily. However, the modernization program will raise product quality and refinery efficiency. Outmoded units slated for retirement are three thermal cracking units, a polymerization unit, treating plant, and power station (OGJ, May 9, '60, p. 178).

The new units will cut production of heavy fuel and increase production of higher value products, American Oil says.

Besides the three new units, the program has several off-battery-limits projects, most of which are being done by refinery forces.

These are some common features of the major units:

- **Treating facilities** are an integral part of each unit. Thus, raw feed enters and finished components leave the unit.
- **Units** are being constructed without reference to scale models.
- **Air-cooled heat exchangers** will perform a majority of cooling for the pipe still and cat cracker. Alkylation will have conventional water cooling because of lower process temperatures. The extensive air cooling points up its growing use along the Gulf Coast. Cooling-water towers at each unit will meet cooling-water requirements.
- **Electronic instruments** and graphic panels will adorn each of three control rooms. Also, each unit will have stream analyzers. Initially, control will be conventional. However, computer control could be added later.

Here are some details of the units which are rising rapidly to become part of the skyline at American Oil's refinery.

Pipe still. Crude charge will be 150,000 bbl. daily to make it the world's largest. Process design was by American Oil and was based on its experiences with the 140,000-bbl.-daily pipe still at Whiting, Ind.

Processing will be highly integrated and have in the one unit fractionation, vapor recovery, and treating. Crude will be fractionated in atmospheric and vacuum towers. Vapor-recovery plant will consist of a depropanizer, debutanizer, and gasoline splitter.

Many streams will be treated before entering and leaving the unit. Initial treating will be desalting the crude charge. Gasoline and kerosine will be treated in copper chloride treaters and butanes caustic washed. Also, all the refinery's sour-water

streams will go to a sour-water stripper in the pipe still.

Atmospheric - tower heaters will absorb 380 M.M.B.t.u. per hour and vacuum tower heaters 180 M.M.B.t.u. per hour. Heater tubes, some as long as 90 ft., will be used. Atmospheric heaters will have carbon - steel tubes and vacuum heaters—5% Cr tubes.

Majority of construction is with carbon steel except for some alloys in certain towers and drums.

Air-cooled heat exchangers will have 900,000 sq. ft. of extended surface and water coolers 75,000 sq. ft.

Air cooling, while more expensive initially, will save money in the long run, American Oil says. Payout is realized from lower operating and maintenance costs for air cooling.

Catalytic cracking. The cat cracker is big but not the largest ever built. It has interesting features in its heat-recovery system, compressor drives, and reactor risers. Capacity will be 47,600 bbl. per stream day fresh feed and 49,000 bbl. per stream day recycle, including slurry.

Light and heavy-gas-oil charge normally will come directly from the pipe still without prior cooling.

The catalytic cracker will be Kellogg's Orthoflow "B" design. The reactor is on top and the regenerator on the bottom in this configuration. The reactor top will tower 180 ft. above grade. The regenerator will be 50 ft. in diameter and the reactor 38 ft.

It will have a multiple riser arrangement to increase operating flexibility. Two risers will be for fresh feed and one for recycle. Temperature and flow rate can be varied in each.

The regenerator will have three-stage cyclones. Coke burning capacity will be 58,000 lb. per hour. Synthetic catalyst will be used.

Power for the regenerator air blower and the vapor-recovery gas compressor will be supplied by tandem-drive steam and gas turbines.

CO boilers and waste-heat boilers using gas-turbine exhaust and regenerator flue gas will increase thermal efficiency. Also, these will permit American Oil to retire one of its power stations.

The vapor-recovery plant will have an absorber-stripper, secondary absorbzer, debutanizer, and propane-butane splitter. The light cycle oil, gasoline, and butane streams will be treated before leaving the unit. Propane-proplyene stream will be desulfurized.

Air-cooled heat exchangers in the cat cracker will total 450,000 sq. ft. of extended surface and water coolers 150,000 sq. ft.

Alkylation unit. Capacity of the sulfuric acid alkylation unit will be 14,600 bbl. per stream day of debutanized alkylate and will be the world's largest of its type. It will alkylate both butylenes and propylenes. Eight Stratco contactors will be installed.

American Oil will receive all required sulfuric acid by barge and pipe it about two miles to storage tanks.

Also, the alkylation unit will have butane-isomerization facilities and a large butane splitter for butanes from several sources in the refinery.

A 10,000-hp. steam turbine will drive the refrigeration compressor. Contactor drive also will be steam turbine.

Off-battery-limits projects. Refinery crews will install more than 15 miles of pipe outside of battery limits. Size varies between 2 and 20-in. diameter. The pipe will be installed on 162 galvanized pipe supports of several heights.

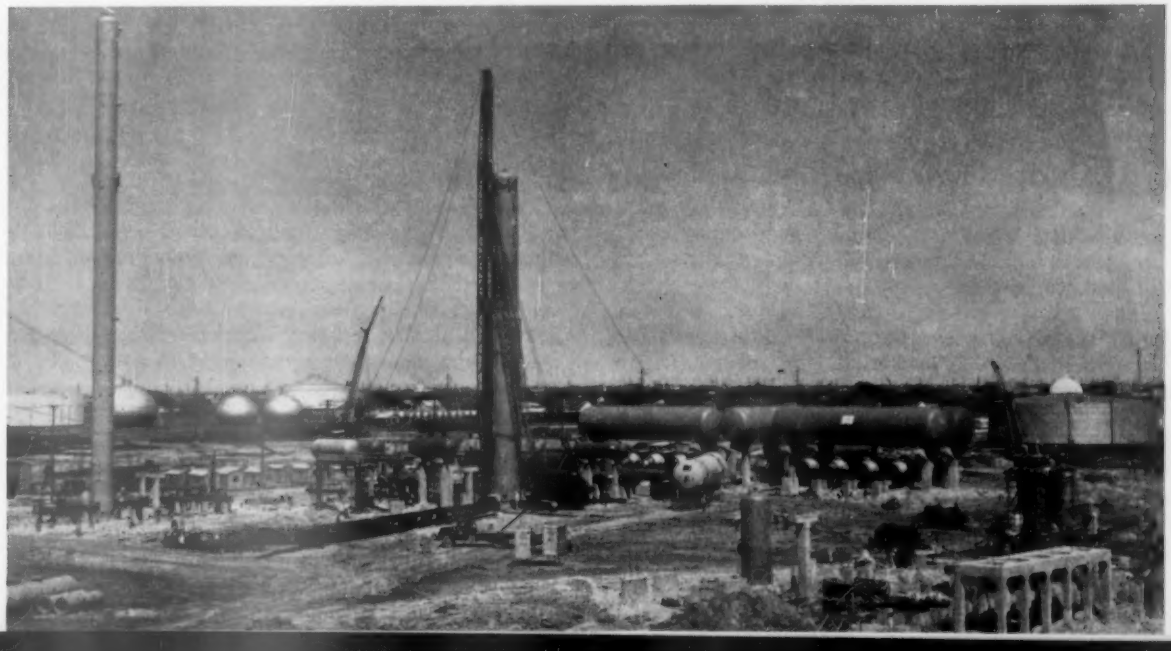
American Oil will change its method of blending crudes. When received, crude will be segregated into four different types. Operators at the pipe still will control remote charge pumps in the tank farm and feed each crude to the still at any selected rate.

Previous practice required blending the crudes into other tanks before charging to the crude-processing units.

Remote tank gaging will be installed.

No tanks will be added. In fact, three tanks have been dismantled and another moved to make room for one of the three new units.

ALKYLATION UNIT, looking northeast. Tall vessel, far left, is the reformer butane splitter and the other tall vessel is the depropanizer. Horizontal vessels, right, are the acid settlers for the Stratford contactors below them. Foundation work in immediate right foreground is for the isomerization unit.



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J. A. BROOKS
Standard Oil Company (Ind.)
Whiting, Ind.

F. W. KOPF
Atlantic Refining Co.
Philadelphia

THESE PANEL MEMBERS discussed operating and maintenance problems at the El Dorado, Ark., session of WPRA.

Refiners take a look at
plant-corrosion problems

Tough corrosion problems which plague refiners everywhere also came under the scrutiny of the panel's experts. Here are their answers to questions on the use of corrosion inhibitors and some of the newer onstream inspection techniques.

BANKS: Has anyone used thermometric procedures (similar to temperature-indicating paints or thermochrom temperature-indicating crayons) for onstream nondestructive testing?

OLESZKO: We have been using temperature-indicating paint more and more on critical lines, flanges, regenerator vessels, and cat reformer vessels. This paint certainly lives up to all of its claims. It is a very good paint; it sticks on very well, does not peel, and is decorative. The price, $16.50 per gal., is one disadvantage.

HANDKE: We use about the same type of thing. Our reformers are painted with this paint and we use the crayons on occasions when the hot spots show up to check the temperature level. It is my understanding that this paint does tend to deteriorate after awhile. It begins to show up a light spot at a somewhat lower temperature than you would have expected when the paint was fresh.

BROOKS: Our people say that some of these detecto-paints will change color, for instance, at 630° F. when heated rapidly. But, they will change at around 400°-425° F. when held at that temperature for several days or weeks.

DOYLE: Does this paint require a long drying or curing procedure? Is it relatively easy to put on the paint and make it stick?

OLESZKO: It requires a good painting technique—sandblasting and application. An 8 or 12-hour cure is required.

Catalytic reforming—preheater fouling

BANKS: Has anyone found a good antioxidant to be used to prevent O_2 fouling in process heat exchangers?

PATTERSON: Our experience with antioxidants has been inconclusive. We believe the most effective solution is to blanket the feed tank.

J. E. HARRELL (Universal Oil Products Co., Houston): Several gasoline antioxidants have been tried with no visible success. Even the phenylenediamines, most potent of gasoline antioxidants, have failed. UOP dispersant additives do continue to be the effective compounds for prevention of preheater fouling. However, since these same dispersant additives preserve color and prevent sediment in distillate oils, there are theories that action of oxygen and free sulfur are inhibited.

R. K. McCORD (Aurora Gasoline Co., Detroit): In Detroit, we Unifine sour cat charge. When we first started the plant, we had no gas blanket on the charge

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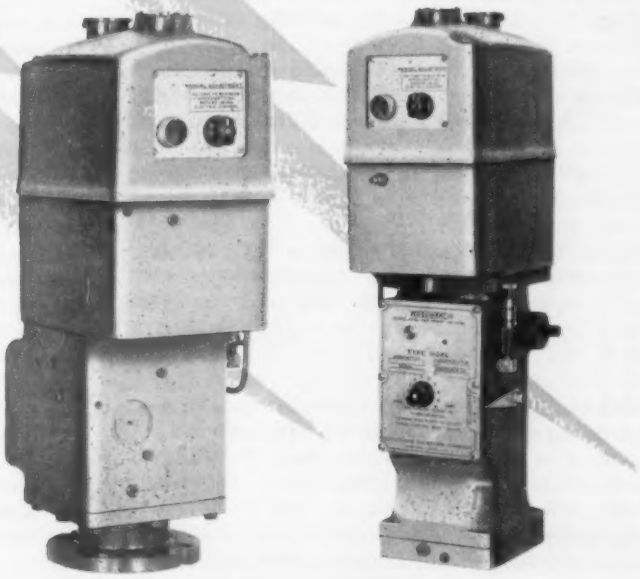

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tank. We found heavy fouling and feed preheat after about 3 months. After gas blanketing, the fouling showed a medium deposit after about a year. Recently on one of the hotter exchangers we changed the metallurgy of the tubes from 7% chrome to stainless steel. After about 6 months service we found the deposit very light, almost nothing. I might add that the change to stainless was also required from a corrosion point of view. The corrosion, however, did not contribute to the fouling materially.

J. W. DALLMAN (International Refineries, Inc., Wrenshall, Minn.): We have recently started a test on an additive to our reformer feed, which we normally feed out of tankage. The results are inconclusive as yet, but it does look encouraging. Whether it will be economical to continue it we do not know. We have now installed corrosion probes on our heavy naphtha from the crude unit. We'll inject this additive at the crude unit rather than at the reformer. We have received recommendations that this will be much more effective. Injecting the additive at the crude unit will also inhibit the feed while it is in tankage. During a recent turnaround we cleaned our reformer-feed tankage, so we're starting off, you might say, from scratch.

BROOKS: Was this a filming amine that you are adding to the crude unit?

DALLMAN: We add a filming amine in the crude tower in the usual manner. This amine will appear in the heavy naphtha. As far as the additive injected into the heavy naphtha is concerned, I'm not sure what type it is. I don't think it is a filming amine.

R. C. CANAPARY (Nalco Chemical Co., Chicago): This is not a filming amine. This is an antifouling additive which acts as a stabilizer and dispersant.

DALLMAN: Is this the same material you are using at Yorktown?

BROOKS: Yes, it is Nalco 262. We've had it in Yorktown for over a year and a half and we're happy with it, but it is expensive. For a 7,000-bbl.-a-day unit, the cost is about $35 a day, but we still think it is worth it.

HARRELL: There are two or three theories that warrant consideration on problem of preheater fouling. Selection of a corrosion inhibitor back on the crude unit, or primary distillation unit, that is also a rust inhibitor will prevent picking up rust in lines and storage tanks that will foul preheaters. Additional injection of inhibitor into rundown lines may be important. Rust not only aggravates fouling problems, but can be most detrimental in finished products.

Preheater fouling may be increased by the corrosion inhibitors used back on feed-preparation units. It is important to use a volatile corrosion inhibitor or one that will not leave heavy organic deposits.

On the use of UOP dispersant additives to prevent preheater fouling, several items may be considered. The normal use is to inject additive in feed to preheat train to kep fouling dispersed. Coupled with the tried and proved procedure of gas blanketing feed tanks and charging fresh stocks from primary feed-preparation units, the dispersant-additive approach is excellent. Large quantities of storage materials and cracked products can often be included in unit feed without exceeding dispersant power of the additive.

Another theory on use of the dispersant additives is based on the color and sediment-stabilizing potential. These same dispersant additives are used to preserve color and prevent sediment on storage of distillate fuels, particularly No. 2 fuel oil. To take advantage of these properties it is necessary to use the dispersant additive as a corrosion inhibitor in primary distillation units or to make supplemental injections in rundown streams that are potential sediment formers.

HANDKE: We have three reformers and we have a different problem on each one. On our unit at Toledo everything is fed directly. It does not go to tankage at all, contains about 20 to 25% coker gasoline, and we have essentially no fouling problem. Here we do not put the hydrogen in until just before the reactor. Some people have looked at hydrogen this way and that way, as if it might be a factor in the fouling. We don't have any problem.

At our Cleveland refinery where we have nothing but virgin feed stock, we have gas-blanketed tanks and filtered the feed. We run as much of the feed directly to the pretreater as possible. We do have to pull some in out of tankage to take care of periods when the unit is shut down and we're still producing feed. This may amount to 10 to 20% of the charge. We used to get runs of about 3 months, during which time the rate would drop from 11,000 bbl. per day to down about 9,000 bbl. per day.

We tried two or three different additives and they never helped. We've never been able to pick up any oxygen in the feed because we do strip it before we put it into the feed-preheat train. We did find some relief by lopping off some of the front end of the feed, instead of running at 200° F. initial. Running around 210° F. initial seemed to improve the fouling problem to the point where we were running 6 months. It's hard to visualize what there might be in here unless we're getting some skin cracking or some such thing in our crude unit.

The unit at Lima is our real problem. We have about 20% coker distillate in that unit, too. We have been using additives, which seem to help, but cost us $70 to $80 a day. We have put in spare exchangers and a spare preheat furnace. We've finally reached the point where we're trying to feed as much direct as possible. We put additives in from the units which are producing the feed stocks, so that this additive is in the feed stock as it goes through tankage with some of the feed due to shutdown. We've had some recent indications that we may be helping ourselves.

We have tried filters at Lima also. This did not seem to help the problem any, and it was costing us so much money on these filters that we finally gave up on that. We used a five-m. filter. You can see we sort of run the gamut here of what is good, what

helps, and what doesn't help. In some cases we've helped ourselves and other cases we haven't. This adds up to the same story. What's good for one person isn't necessarily good for the other one.

DOYLE: I wanted to make a comment on using a dispersant. In one of our units—a distillate fractionator—we don't have desalting equipment and we get quite an organic deposit from the feed plus some salt. The deposit would be sufficient in a matter of a couple of months to shut us down. By injecting a dispersant in 10 to 20 p.p.m., we eliminated the organic portion of the deposit but the salt portion is still laid down. I thought it was worth mentioning because it doesn't help salt problems at all. We can get rid of the salt, or at least we can move it by steaming periodically and this we do. But the salt apparently doesn't hurt the effectiveness of the dispersant, or the dispersant doesn't help the salt.

KOPF: We have used 12 p.p.m. of Polyflo-100 in a unit which has 15% visbreaker naphtha in the charge stock. This has increased the time between cleaning the exchanger system from 20 days to 150 days. We consider that justifies continued use. On another unit with virgin feed, we have a gas-blanket system that increased the time cleaning from 60 days to 150 days. On the gas-blanketed unit, oxygen in the feed stock was 70 p.pm. before the gas blanket and 7 p.p.m. afterward. We also use filters on our feed stocks to prevent scale and dirt from getting in on top of the catalyst beds. This also, of course, helps the exchanger system.

BROOKS: What micron size will these filters pick up and how effectively?

KOPF: They do an effective job as far as we're concerned. They are supposed to take the material down to 2 m. We don't have any proof that they do that; however, we don't have any reason to believe they don't. We have had occasion to use one recently in another service where there was a very fine material involved and it's doing a very good job.

BROOKS: How often do you replace the element?

KOPF: About every 3 or 4 weeks we reach a pressure drop of about 20 psi. They will build up to that pressure in that period of time. We have two on each unit and it takes us about 4 hours to change the elements.

B. A. KREITER (Gulf Oil Corp., Port Arthur): We recently installed filters on one of our reformers. To date the length of runs has not increased, so filters are not a cure-all. One of the problems is that the filters don't hold up much dirt. They plug up pretty fast.

Catalytic reforming—filming amines

BANKS: Are filming amine corrosion inhibitors used extensively in cat reforming operations? We have a corrosion problem on the prefractionator overhead system and have been hesitant about using corrosion inhibitors because of possible poisoning of the platinum catalyst.

DOYLE: I assume the question here concerns the nitrogen that would be entering the reformer with a corrosion inhibitor. We've probably had as much inhibitor get into the system as anybody. A good share of this did not go any further than the feed exchangers where it deposited as rubber. When we opened the exchangers, the bundles came out like a sponge. We have had a lot of amine in the plant and it didn't appear to materially affect our operation. We did not have difficulties having to go up in temperature to compensate for the nitrogen. We had a fairly decent catalyst life on this run, while we've gotten much poorer catalyst lives with a lot less injection of amine inhibitors. Net result is that I don't think filming-amine inhibitors hurt the reformer, if used judiciously.

HARRELL: After several years of reformer operation, UOP feels that the effect of these inhibitors is not too noticeable on catalyst life. If you have a corrosion problem and discriminately use corrosion inhibitors in the prefractionator, you probably do not expect noticeable lowering in catalyst life. Field men frown on any discriminate use. Look very closely at the injection and control to prevent running any undue amount of inhibitor into the reformer. The second part is a corrosion problem due to pH on the prefractionator overhead system. We have been hesitant about using excess corrosion inhibitor because of possible poisoning of the platinum catalyst. The procedure of pH correction is good and, in addition to using a light hydrocarbon-soluble amine in the prefractionator overhead, we also tend to correct pH by injection of a little water with a pH-correcting material added. That gives you added advantages on flushing and a more exact pH control when you are using minimum amount of corrosion inhibitor.

OLESZKO: We have used ammonia. The ammonia does not enter into the reactor feed because usually in a prefractionator you take off the light cut containing the ammonia. We have had very good success without noticing any nitrogen effect in our reactor. We have very good protection in the overhead system.

BROOKS: Care is needed when using these materials because of the fraction of feed going into the reformer. Some units take the total prefractionator overhead to the reformer. If so, I don't think water or ammonia would be a good idea. If you're taking a side stream from the fractionator, then water and ammonia are okay. In other words, judicial thought is needed on where these amines or ammonia might go. You don't want excessive amounts in your reformer reactors.

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Catalytic reforming—hydroblasting

BANKS: What methods have been used to clean organic fouling from naphtha preheat exchangers?

HANDKE: The only really good method that we have found to clean this scale is a hydroblast. We have one in the company and ship our exchangers there to be cleaned. We found this to be about the only way to get this scale off. This hydroblast I'm referring to is a water-sand combination.

BROWN: One of our plants is using one of the Oakite products successfully, although occasionally the bundle is taken out for hydroblasting. At another plant hydroblasting is used only. In this particular unit, muriatic acid was used once and tube pitting resulted.

DOYLE: The hydroblast would be preferable. We have used sandblasting on some of the G-fin units and, of course, resort to using the hand saw on some of the bundles. I'd like to suggest—if somebody had the nerve—that just before shutdown they inject some dispersant and see if they couldn't move it off and then shut down quickly.

KOPF: Chemical methods of cleaning would probably be favored over hydroblasting or turbining. However, knowledge of the type of deposit is required and the effect of the chemical on the metal is desirable, so you won't get into a stress-corrosion situation later on. You have to be pretty careful.

H. N. FROST (Pure Oil Co., Nederland, Tex.): We have been kicking around the possibility of cleaning a reformer preheat exchanger while in service by slugging or injecting catalyst or sandblast sand. We are getting close to a down and I'd like to ask if anyone here has considered it, whether they have done it, or have any information as to someone who might have done it, and they have any results on it? Not hydroblasting, but cleaning the exchanger while in service by injecting catalyst, sandblast sand, or something of that nature to pick up the heat exchange.

HANDKE: If you plan on running and not shut down due to a plugged reactor, I think there would be the possibility that you're going to plug the top of your reactor.

FROST: In our particular case, over a period of time, we do build a layer of iron oxide, rouge, rust or sulfide, whatever you may wish to call it on top of the case. There are some who have baskets in the top of the reactor to take care of this. It is our thinking that, after they have operated for awhile, they may have laid down enough scale to stop the smaller particles of sand or catalyst coming through. We're going to come down anyway.

Onstream inspection

BANKS: Are there any new developments with respect to the use of onstream nondestructive testing to implement or replace scheduled shutdowns for inspection purposes?

HANDKE: Well my comments certainly don't give any light on any new developments, the type of thing we do, is probably the type of thing most everybody is doing, using onstream X-ray for piping thicknesses, use of video gage and that type of thing for nondestructive testing.

DOYLE: We use the X-ray and gamma-ray inspection. But there is also a newer method. It's an Ultragage with which you can take onstream readings at high temperatures. Some of you have used this procedure. We have not yet, but will be using it shortly.

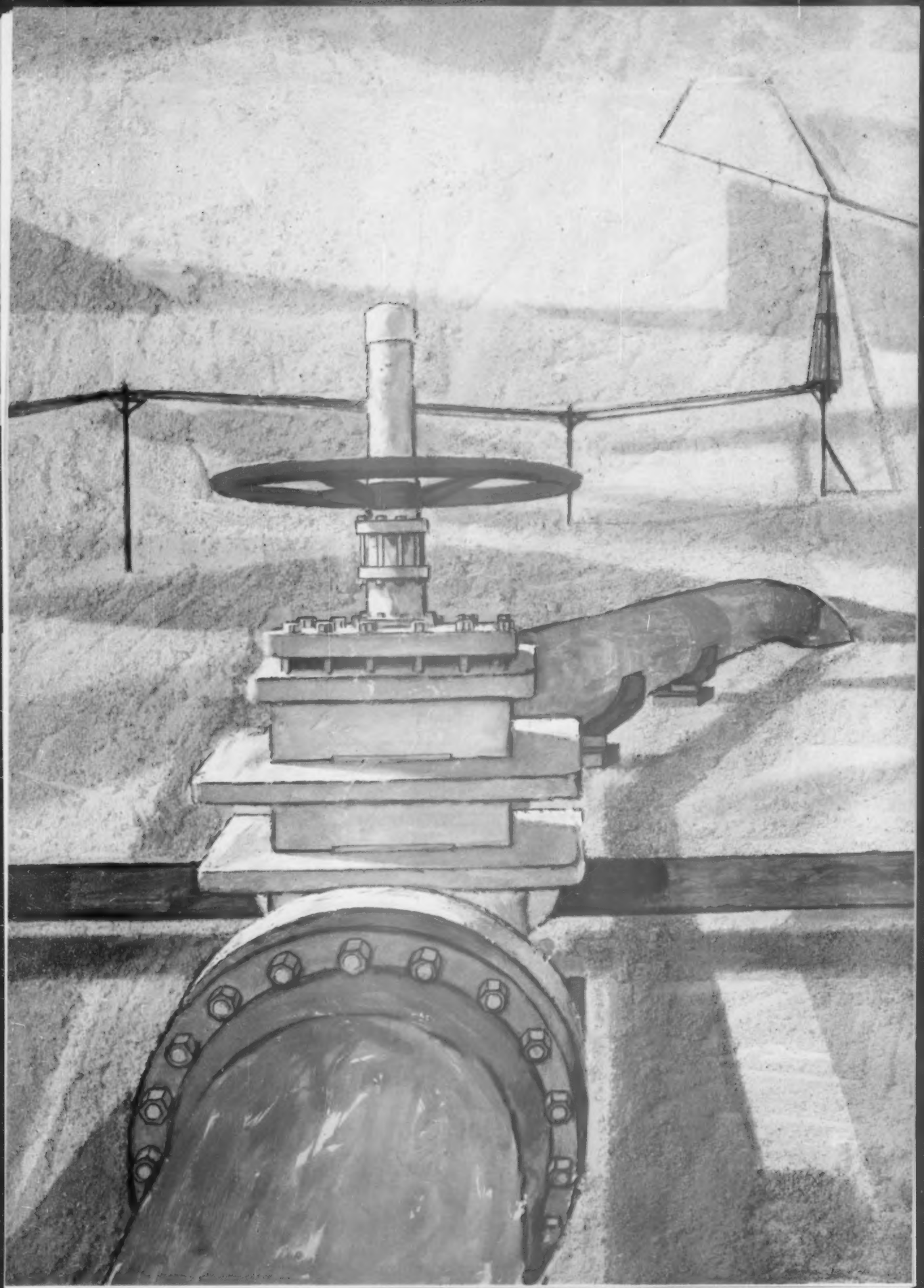
With this apparatus an audio signal is transmitted through water into the pipe. The return signals are shown on a scope and the interval between signals is converted to pipe thickness. Because of the water they are able to take these readings on very hot lines. I understand they have had readings on lines as hot as 1,050° F.

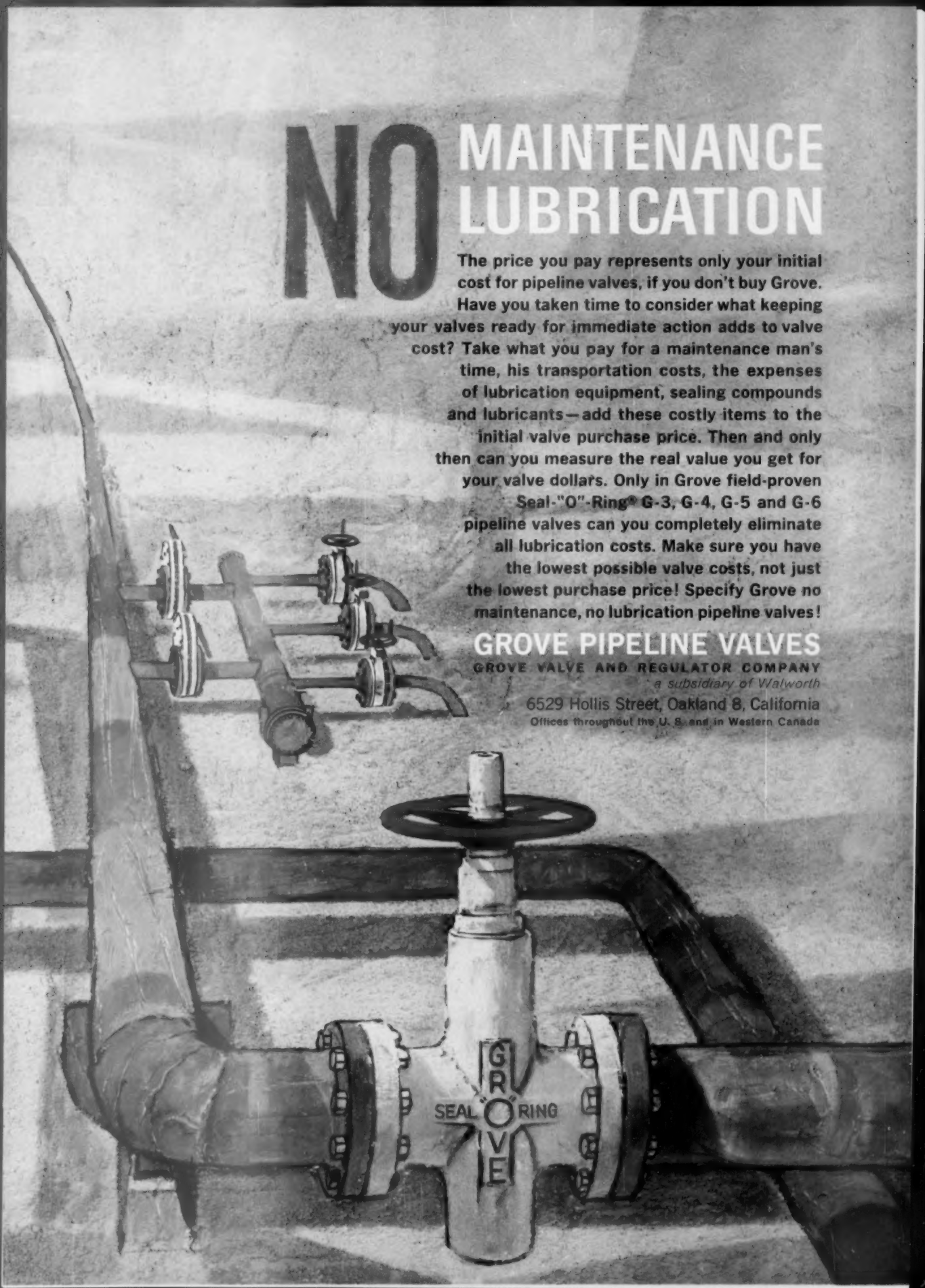
The readings are taken with a small probe. The reading instrument, the Ultrascope, is perhaps 100-150 ft. away from the man who is taking the reading. And they are able, by moving the probe, to make a very definite pattern for pits, faults, or weld cracks in the metal. They are not able to tell you just what they see, but they can tell you what thickness of metal you have until you hit the first fault.

As I understand it, they can read down to 0.1 in. and up to 2 in. without changing the range of the equipment. And if you want to go to a thicker metal reading they can do this, but it would require a range change. International Inspections, Inc., are the people promoting this form of inspection. Within limits, we consider radiographic inspection to be most desirable, but it is relatively slow and therefore costly in comparison to the Ultragage.

BROWN: We are using this Ultragage by International Inspection. We consider it good up to at least 1,000° F. We are using it very extensively and we have great hopes for these onstream techniques.

BROOKS: We have had unusually good success with radiography and have used it frequently for onstream nondestructive testing and we're very pleased with it. The Oil and Gas Journal, October 24, 1960, p. 95, has an extensive discussion of onstream inspection.





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BANKS: Has anyone experience with chemical cleaning of aluminized or calorized tubes? What chemical was used? What experience has anyone had with aluminum tubes in overhead condensers or coolers?

BROOKS: One of our refineries tried cleaning some aluminized tubes with a hot-water solution of a detergent. The detergent, according to my information, was Triton X-100; however, the results were not satisfactory as only loose material was removed from the aluminized furnace tubes. We have no aluminum bundles in condensers or coolers that I am aware of.

BROWN: We have several aluminum bundles in overhead salt-water-cooled exchangers on a stabilizer. We have been putting in aluminum in place of Admiralty. Aluminum lasts several times as long as Admiralty and is a lot less expensive. We also use an aluminum bundle in a very difficult overhead condenser for a waste-water stripper, stripping ammonium sulfide water. This gives a service life several times that of steel. If you have an aluminized tube, don't wash it with hydrochloric acid.

HANDKE: We have some aluminum bundles in our synthetic-tower overhead condensers on our TCC unit and we got much better service life out of these than we previously had on the Admiralty tubes—3 to 5 years. We've never done any chemical cleaning or anything like that. We do have two or four aluminum bundles on that service.

BANKS: What is the corrosion experience in refineries where mild steel has been substituted for copper alloys in heat-exchanger bundles? Is corrosion greater on the process side or water side in most of these cases?

HANDKE: We don't have any experience yet. We have changed some of the bundles at our Toledo refinery, but we haven't had a chance to look at them. We haven't any definite trend on changing over to mild steel.

BROOKS: The answer to the second question is that the corrosion is worse on the water side unless treated water is used. The main trouble on the water side is fouling. Copper alloys are used to avoid this problem.

DOYLE: We use Mississippi River water for cooling and there very obviously is a difference. Corrosion on the water side is very severe when using mild steel. We experience very heavy scaling also on the water side if the temperature gets up at all on the water outlet. We don't have this problem with Admiralty. Waterside fouling becomes a problem at low velocities.

TEX COLLINS (Nalco Chemical Co., Beaumont): We have, over the years, worked on both process and water side in the protection of equipment from corrosion. There have been a lot of problems on the water side where steel exchangers are used. Within the last couple of years, however, we have had success in systems with all-steel condensers. This success is in the area of preventing corrosion and eliminating large pressure drops across steel bundles. Our progress is due primarily to the use of pretreatment programs to clean up and passivate metal surfaces before going on stream with a new bundle, or after acid cleaning. Follow the pretreatment step with a regular cooling-water-inhibitor program and you should have very little, if any, trouble due to corrosion or high-pressure drop.

ROBERT PONDER (Clark Oil & Refining Co., Blue Island, Ill.): We had one particular application in our refinery where we were having difficulty with Admiralty tubes being corroded on the hydrocarbon side. We substituted steel tubes. Then we ran into difficulties on the water side. We compromised by using bimetallic tubes, and we've been pretty well satisfied ever since.

DALLMAN: We recently put in a new condenser on a straightrun stabilizer on a revamp job in which we specified Admiralty inside of steel tubes. We don't have any experience as yet, but it might be of interest to know that the complete condenser (470 sq. ft., 230 psi.) ran about 10% more than the same unit with Admiralty tubes.

W. J. BARAL (Union Oil Co. of California, Brea, Calif.): We have just had some experience with some at our foreign licensees who have been using a bimetal tube of aluminum and Admiralty. The Admiralty is for water and the aluminum is for a hydrocarbon H_2S atmosphere. They claim that they were expecting good results and had had good results in this type of service. I don't know whether such tubes are available in the United States.

Compressors

BANKS: What is experience in using film-type corrosion inhibitors for gas-compressor suction lines? Does detergent effect help keep compressor valves clean in sour-gas service?

OLESZKO: There are several reasons for compressor-valve fouling. If you don't have a good dry gas coming into the compressor, the gasoline vaporizes on the hot surfaces of the valve and consequently forms gum from the residue due to presence of olefins.

We had a good demonstration of this when we originally installed the cat cracker reciprocal compressors with steam jackets on the suction lines. This worked very well, and we didn't have any fouling on the compressor valves nor the cylinders. About a year or two later somebody forgot to turn on the steam on these line jackets and the valves had to be knocked out with a sledge hammer. It happened on two or three machines before anybody realized what had been going on. We feel that preheating the gas, just 2 to 5°, will eliminate this problem.

This did not help in a stream which had a rather high concentration of butadiene and probably some acetylene—a fluid-coker gas stream. We borrowed a little item from war-time operation of the butadiene plants. We are using tertiary butyl catechol injection ahead of the cylinder. The tertiary butyl catechol is dissolved in an aromatic-rich solvent such as cat reformate. We made a mixture consisting of 2.5 qt. of tertiary butyl catechol in 50 gal of reformate. We add it at a rate of 2.5 qt. per day per cylinder. Since we have been doing this we have had no problem with gumming of the valves and cylinders.

BROOKS: I would like to ask Jim Harrell a question: I understand that you saw improved performance as a result of adding filming amines ahead of the compressor in one Puerto Rico refinery. In the first place, how was this injected? And in the second place, have you had any experience of reducing fouling in circulators on reformers where they have ammonium chloride deposits?

HARRELL: On the first question, the procedure normally is, in the case of cat unit reciprocating compressors, to add filming-amine inhibitor before each stage. On cat unit centrifugal compressors the procedure may be different. Inhibitor is added only after looking the condition over very well and being sure the unit is clean to start. We will recommend using a particular inhibitor—a light hydrocarbon-soluble type. You get detergency, to answer that part of it, and you do get corrosion protection. Before you add inhibitor, particularly on large cat unit centrifugal units, there are other techniques you can use and in a lot of cases you can stop corrosion without having to add inhibitor. One of those techniques is water injection into main-fractionator overhead-vapor line. Reformer circulators are another problem. Sorry, I can not comment on that question.

Is this inhibitor fogged in? One of the problems of putting these things in is getting distribution. Is it put in through a fog nozzle?

HARRELL: It is desirable to dilute inhibitor back and put it in through an injection nozzle. Many of the refiners that have been using this material for years just pump it into the line. Inhibitor runs on down the line and is swept into the compressor suction. They have good operation so it is hard to insist on an injection nozzle.

DEA units

BANKS: What corrosion inhibitors have been used with success in amine sweetening units? Where are they added or injected?

BROWN: We had a DEA unit where the solution was getting pretty old. This, of course, brought about higher reactivation temperatures as well as direct corrosion. We were losing our steel reboilers in 7 months. By using a Magna 85A we increased its life from 7 months to 12 months. Of course, keeping the DEA in better condition would be in the right direction also.

DALLMAN: We have a DEA unit which was installed in 1953 to treat liquid poly feed. We have had no corrosion in the reboiler. It has been published in the literature and is fairly common knowledge that temperature on a DEA boiler is important in avoiding corrosion. To avoid high skin temperatures in the reboiler, a safety valve was installed on the steam chest to prevent pressure from rising above 40 psi.

Last year we started adding corrosion inhibitor with the DEA at a rate of about 1 pint of inhibitor with each drum of DEA. This may seem to be a high concentration. But we add DEA so seldom that we are still on the first 10-gal. drum of inhibitor. So the cost is small. This year, when we inspected the unit, we found it clean and in good shape. We do not add any antifoam with the corrosion inhibitor because we were advised that it is unnecessary if the unit is clean.

DOYLE: We have a DEA unit in the same service, and we have considerable corrosion in the reboiler circuit. The steel reboiler was replaced after 4 years.

GEARHART: We replaced the regenerator with 18-8 material. We have not experienced any further problems.

BROOKS: We have an MEA unit on our sulfur plant in Whiting and we're using Kontol. We're adding a pint a day and this gives us about 30 p.p.m. on makeup. We find no corrosion, although we do find some fouling in the stripper reboiler and regenerator.

PARKS: We tried this same inhibitor, among others, without success in one of our DEA regenerators. We eventually had to go the 18-8 route to control corrosion.

BROWN: Well, there is at least another answer—MEA and put in a reclaimer. We can't report on the results as yet, but our amine plant has been converted from DEA to MEA for capacity reasons and we have a reclaimer on the MEA. This, together with a precoat filter for solids control, should contain the fouling and corrosion problem.

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FUEL SAVINGS of up to 20% are possible through the proper control of variables affecting the operation of dual-fuel engines: Combustion-air quantity, charging-air temperature and timing and quantity of pilot oil.

This is the first part of a two-part article on the operation of dual-fuel engines in pipeline service. The second will appear in the May 1 issue.

BY ERIK KELGARD,
Master Mechanic
Trans Mountain Oil Pipe Line Co.
Kamloops, B. C., Canada

Internal-combustion engines used on natural-gas pipelines are almost without exception spark-fired gas engines. For liquid pipelines too, gas is frequently available for fuel at an attractive price. On gas pipelines continuous fuel supply is no problem, but on crude or products lines it is generally considered prudent to have engines capable of operating on an alternate fuel and able to switch immediately from one to the other. This is why many pipelines are operating dual-fuel engines.

Normally, a small amount of pilot oil is used to initiate combustion of the gas, but the dual-fuel engines are equally capable of burning oil alone. The diesel fuel or crude oil used is generally drawn from the pipeline, both for economy and assurance of supply. Even where costs on an energy basis are equal, the use of natural gas as fuel in diesel engines is attractive because of reduced maintenance costs and reduced lubricant contamination.

Air induction. Normally aspirated diesel engines induct the same amount of air charge each cycle, irrespective of load. Early dual-fuel engines showed satisfactory fuel consumption at full load but, as load decreased, fuel consumption became extremely high. At partial loads the excessively lean mixtures ignited and burned so slowly that combustion was not completed until well down on the power stroke.

In extreme cases of very light load and excessively lead mixtures combustion was so late that a portion of the gas fuel could leave the cylinder unburned. This unburned fuel in the exhaust was not only wasteful but highly dangerous.

This problem was overcome by throttling the intake air. By reducing air quantity in keeping with load, a good mixture ratio could be maintained throughout the load range.

Automatic methods have been worked out to control a damper in the induction pipe. One method uses the governor load position as the controlling medium. For each reduced-load position linkage to the butterfly valve reduces air flow.

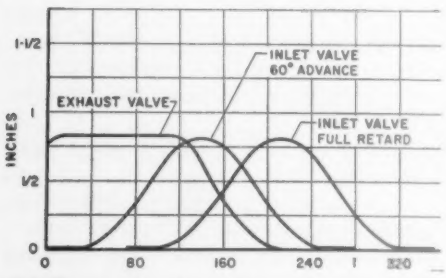
Other methods. Other methods use a servomotor to operate the damper, the servomotor being controlled by a temperature-sensitive probe located in the exhaust duct. As load is reduced exhaust temperature drops because less fuel is burned. This drop in temperature is sensed by the controller which moves to close down the damper and thus maintain the required air-fuel ratio.

With the development of the exhaust-gas-driven turbocharger as a means of increasing cylinder-air charge and thus higher horsepower capability, the problem of maintaining fuel-air ratios for best efficiency with dual-fuel engines has become more complex. This is particularly true where very high charging pressures and high brake mean effective pressure (b.m.e.p.) are involved.

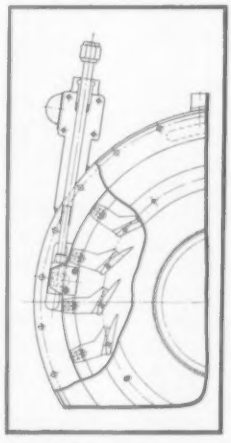
Trans Mountain Oil Pipe Line has 24 diesel engines installed in seven pump stations. Twenty of these are eight-cylinder engines rated 2,000 b.hp. at 514 r.p.m., four are six-cylinder units rated 1,500 b.hp. at the same speed.

The engines have a bore and

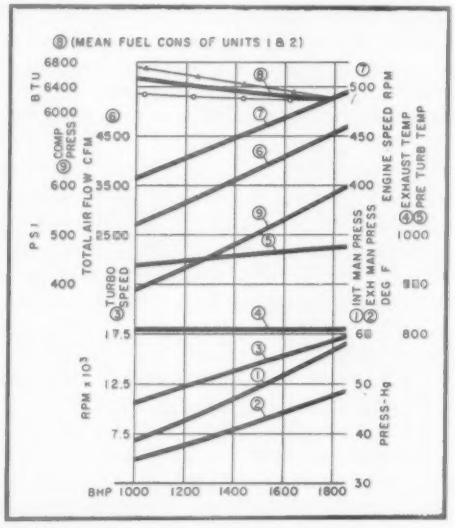
*Presented at 1961 ASME Oil & Gas Power Conference, New Orleans.



CRANK angle valve-timing diagram shows change in valve area. Fig. 1.



ADJUSTABLE guide vane. Fig. 2.



COMPOSITE performance curves for dual-fuel type of engines. Fig. 3.

stroke of 13 by 16½ in. and at full load the b.m.e.p. is 176 psi. Sixteen of the engines are arranged for dual-fuel operation, and all are connected to centrifugal pumps.

The engines are built in accordance with the Miller system of low-temperature supercharging.[1]

Efficiency

It is characteristic of the supercharged compression ignition engine that it loses thermal efficiency with increase in load. On the basis of brake thermal efficiency (indicated thermal efficiency × mechanical efficiency) the lowest fuel consumption occurs below full load, usually at about 75% load.

With a greater amount of fuel injected into the combustion chamber, a longer time is required for the fuel droplets to find the necessary oxygen for complete combustion. Thus expansion is decreased and thermal efficiency suffers.

Gas as fuel. When natural gas (methane) is used as the principal fuel, both the gas and air charge are inducted into the cylinder on the suction stroke. At the end of the compression stroke, therefore, there is a more homogenous mixture than is possible with liquid-fuel injection.

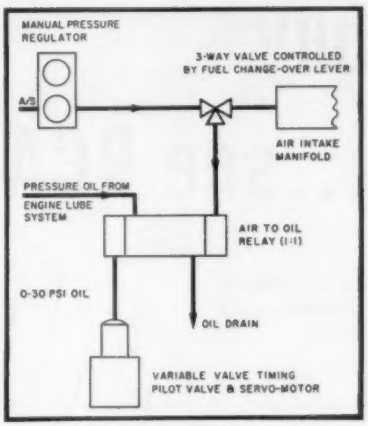
Less excess air is required for rapid combustion and, with a smaller amount of the working fluid present, less fuel needs to be burned for an equal pressure rise.

On oil the best efficiency was obtained with 100% excess air while best performance on dual fuel was achieved with about 60% excess air (chemically correct air for methane—17.22 lb. of air per 1 lb. of fuel).

Thermal Loading

The limit to which the thermal loading of an internal-combustion engine can be increased is set by the maximum temperature the metals surrounding the combustion space can tolerate without failure or deterioration leading to excessive maintenance costs. This temperature, and the temperature of the jacket water, establish the maximum temperature gradient possible for the engine for external heat rejection.

It is clear that if the load limit is to be increased above that set by the rejection of heat to the jackets, other methods must be found to remove additional heat from the internal surfaces.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VARIABLE VALVE TIMING PILOT VALVE & SERVO-MOTOR

VARIABLE valve-timing control. Fig. 4.

One way this can be done is to lower the temperature of the charging air entering the cylinders, making possible a greater flow of heat from the head and cylinder walls. If this higher rate of heat rejection to the air is balanced so that the colder air mass absorbs the additional heat without raising the initial temperature of the air at the beginning of compression, the engine will operate at the higher horsepower without failure.

Reduced temperatures. There are several ways in which the charging air can be reduced in temperature outside the cylinder. It can be passed through a heat exchanger (intercooling), expanded through a turbine doing work, or a combination of these two.

An economic and effective way of obtaining low-temperature air is by (1) Compressing the air charge to a higher pressure than required by the engine, (2) removing as much of the increased internal energy as possible in an intercooler, (3) admitting the correct weight of this high-pressure, cooled air to the cylinders in accordance with load requirements, and (4) allowing it to expand behind the piston, doing work, from a high pressure to a lower pressure until the piston reaches bottom dead center.

This is essentially the method used in the Miller system engines. Air flow to the cylinders is allowed to follow turbocharger output up to approximately 75% load (about 135 b.m.e.p.) corresponding to the capacity of the engine as a conventional Buchi supercharged unit. From this point on the air is metered into the engine to give constant compression pressure.

To accomplish this the engine is equipped with a variable inlet valve timing mechanism that permits valve timing to be adjusted from closure to 60° on the suction stroke, with a corresponding variation in valve opening from 40° to 100° on the exhaust strokes.

Valve Timing

Changing valve timing affects engine operation in three separate ways:

1. Advancing valve timing increases valve overlap and thus increases the quantity of air that flows across the piston crown and cylinder deck during the scavenging period. Apart from the clearing away of spent gases from the combustion chamber this increase in air flow also carries with it a large amount of residual heat from the chamber walls materially assisting in lowering cycle temperatures.

2. As inlet-valve timing is advanced the point where full opening of the valve occurs approaches the upper end of the induction stroke. The effective orifice open to flow of air, therefore, changes and acts as a metering orifice. (See Fig. 1, which shows schematically the change in valve area.)

3. The correct weight of air having been metered into the cylinder by the action described in (2) the air now expands inside the cylinder releasing internal energy by doing work on the piston as described.

Valve mechanism. The valve mechanism is positioned automatically through a pilot valve and servomotor arrangement in consonance with air-manifold pressure.

This system works extremely well on oil and a better-than-average wear pattern has been experienced with this type of engine operating as an oil-diesel. However, operating the engine on dual-fuel using the same principle would result in an increasingly lean mixture as load decreased, as the valve gear would move to maintain constant compression pressure. We would, therefore, have the same undesirable condition as for normally aspirated engines.

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Air-Fuel Mixture

Both the variable-inlet, valve-timing mechanism and control of air-manifold temperature were used to obtain the correct weight of air in the cylinder at a temperature to maintain constant compression temperature.

There are, however, practical limits to this method since at low loads it becomes impossible to advance the valve timing enough to maintain constant air-fuel ratio. A point is reached where it becomes impossible with low load to increase the air-manifold temperature to maintain adequate compression temperature.

Apart from the mechanical limitations mentioned, the use of two variables for air-fuel ratio control makes it necessary that operating personnel be capable of determining the results of each adjustment that is made. Since engine speed and load vary with the pipeline requirements through an automatic control system this is not practical.

In arriving at an acceptable solution to our problem of reducing air flow when operating on dual fuel we first investigated the effects of throttling the intake air both before and after the turboblower. Throttling on the discharge side was found to cause the turbocharger to become unstable (go into surge).

Speed erratic. This is particularly true during the transition period from oil to gas operation. This in turn results in erratic engine speed which is upsetting to the whole station-control system. It also has the drawback that it is wasteful of power, and exhaust back pressure remains higher than necessary, decreasing the differential pressure between intake and exhaust manifold and adversely affecting the scavenging process.

Throttling on the suction side of the blower also tends to produce surge with relatively high-ratio blowers, again principally during changeover from one fuel to another. Apart from this a butterfly-type valve is difficult to handle for accurate control at high air flows.

We also tried reducing air flow by blowing off excess air both to atmosphere and back to the suction side of the blower. This method has the same drawback as throttling on the discharge side of the blower in that it is wasteful of horsepower and destroys manifold differential pressure.

DIESEL ENGINE LINER
WEAR INSPECTION RECORD

STATION	ENGINE No	MAKE	ORIG LINER BORE
EDMONTON	0335		NOMINAL 13.000
DATE MAY 8 1960		ENGINE HOURS 29,062	

CYL. No.		LOCATION BELOW TOP A 2 1/2"	B 11 1/2"	C 20 1/2"
1	PAR	.003	.003	.003
	90°	.0035	.0028	.00
2	PAR	.003	.004	.0035
	90°	.003	.0047	.004
3	PAR	.004	.004	.004
	90°	.0048	.0045	.0045
4	PAR	.0023	.003	.003
	90°	.003	.0025	.003
5	PAR	.002	.0015	.0015
	90°	.002	.003	.003
6	PAR	.001	.001	.001
	90°	.001	.002	.002
7	PAR	.003	.0035	.0035
	90°	.002	.003	.003
8	PAR	.002	.002	.002
	90°	.0045	.004	.004

DIESEL-ENGINE LINER wear-inspection record. Fig. 5.

The best and most effective method found was by means of speed control of the turbine. This normally requires that the inlet guide-vane settings or the nozzle ring of the turbine be changed, something that is usually not possible without disassembly of the machine.

Turbocharger speed. In our experimental work to determine the turbocharger speed change necessary for best performance we were greatly aided by fitting to one of our engines a turbocharger having externally adjustable guide vanes. This mechanism enables the inlet guide vanes of the turbine to be moved while the engine is in operation.

Since this turbocharger was installed it has operated for nearly 13,000 hours without giving any trouble with the adjustment linkage. The internal arrangement of this linkage is shown in Fig. 2. While we have only one of our turbochargers fitted with this type of linkage, and it is used primarily for experimental purposes, it would be an extremely useful machine in locations where gas is supplied on an interruptable or seasonable basis.

Our experiments gave up best results on oil when the guide vanes were set 0.7 in. open while the setting for gas proved best at 1.0 in. While opening the guide vanes drops both flow and inlet manifold pressure, the differential head between inlet and exhaust manifolds remains almost the same as for comparable loads when operating on oil. Scavenging rates therefore remain the same. See lines (1) and (2), in Fig. 3. This figure also shows the various operating variables recorded during typical postoverhaul tests.

Following the reasoning behind the Miller internal-expansion cooling system we recognized the need for advanced inlet valve timing at high load. Further development work led us to fix this at 30° advance for operation on gas for all loads, this decision having been reached in conjunction with fixing of the guide-vane position.

On oil the pilot-controlled servomotor is allowed to move the inlet-valve mechanism as explained earlier, the two systems being automatically controlled as shown in Fig. 4. (Linkshaft-actuator control.)

Linkshaft-Actuator

This system works on gas to give constant compression temperature for the following reasons:

1. The load on the engine (a centrifugal pump) varies approximately as the cube of the speed. The turbocharger speed varies with load and, as it is also a centrifugal machine, we find air-manifold pressure following load very closely (line 1, Fig. 3).

2. The orifices open to flow into the cylinders are held constant and cylinder fill supplied at air-manifold pressure will also vary directly with load. The heat picked up by the combustion-chamber walls is also a function of load. Therefore, heat rejected to the air charge is constant per unit weight of air.

3. With air-inlet-manifold temperature held constant and the same degree of internal expansion and heat rejection, temperatures at the bottom of the induction stroke remain constant for all loads. As compression ratio is constant, compression temperatures also will remain the same.

Variations small. We find that exhaust temperatures when operating with this system remain the same for all loads, varying less than 30° F. between 40% and full load.

The piston and liner wear also appear to vindicate our method. Fig. 5 shows the liner wear record for an engine that has operated 30,000 hours.

What's NEW . . . in equipment

Inspector finds inner, outer defects

NEW DRILL-PIPE INSPECTOR is available to locate both inside and outside defects as well as metallurgical defects. Inspection results are recorded on a tape. The maker claims the inspection device makes it possible to determine the condition of pipe exactly without recording of rust, mill scale, and variations in section and hardness.

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As it moves along the pipe, it induces a uniform magnetic field into the pipe metal. A self-monitoring system checks the detectors continuously to see that they operate properly. Source: **Universal Inspection & Service Co., 3600 Yoakum Blvd., Houston 6, Tex., U.S.A.**

Powerful truck to service oil field

ALL WHEELS DRIVE new truck developed recently specifically for cementing, fracturing, and similar operations in the oil field. The Model DF-417 6 by 6 truck, as illustrated, is powered by a 350-hp. diesel engine and furnishes power to operate one of two triplex pumps. Another 350-hp. diesel engine mounted on the deck drives the second triplex pump. Capable of being operated simultaneously, the pumps can handle pressures up to 10,000 psi.

The truck is available either as a 6 by 4 or 6 by 6 unit with a variety of transmissions, including torque converters and automatic transmissions. Front-axle combinations, all with power steering, are available with ratings from 11,000 to 18,000 lb., and rear-tandem axle assemblies are available with ratings from 44,000 to 60,000 lb. Several engines are available for power in gasoline, diesel, and LPG types in ratings from 200 to 350 hp. Gas-turbine engines in ratings up to 1,000 hp. are available to power deck equipment. Source: **International Harvester Co., 510 E. Second St., Tulsa 20, Okla., U.S.A.**

●

New computer accessory

. . . is available for the RW-300 digital control computer. It is an instrument-scanning subsystem designed to detect automatically unusual or dangerous operating trends without interrupting the computer's control calculations. According to the maker, this subsystem lets the computer function as two machines: a control computer and an instrument-alarm scanner. Source: **TRW Computers Co., 202 N. Canon Dr., Beverly Hills, Calif., U.S.A.**

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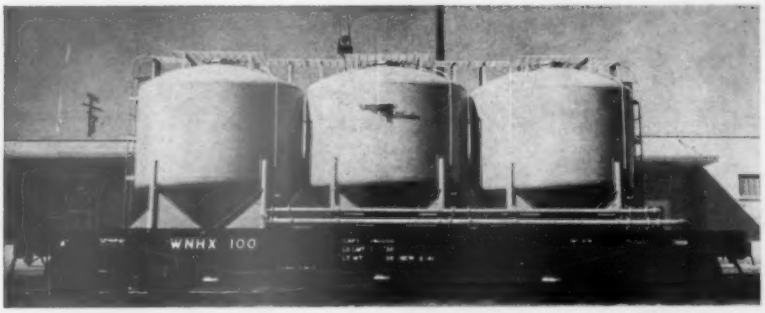

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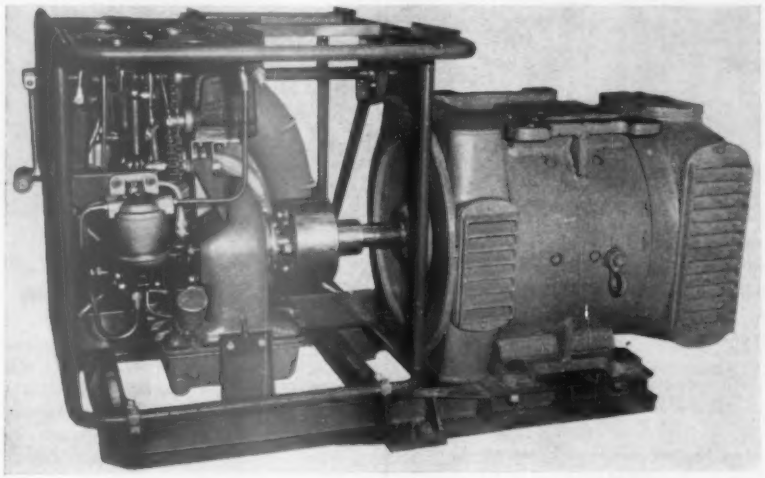
The car reportedly unloads materials anywhere a pipe or hose can be routed. The aeration system is said to make the tanks self-cleaning as each load is moved, a feature that can prevent material waste and contamination. Source: **Halliburton Co., Special Products Div., Duncan, Okla., U.S.A.**



Gas turbine drives 220-volt generator

TURBINE-DRIVEN generator offers a 30-kw., 220-volt, d.c. power source. The Mars gas turbine drives the generator through a clutch type of coupling. Excluding the fuel tanks, the unit weighs about 865 lb. Supported in its own frame, the gas turbine is started by a hand crank. Engine acceleration is automatic after cranking to an output speed of 500 r.p.m.

The clutch permits the generator to be out of engagement while the turbine is cranked and until it reaches a speed of 2,700 r.p.m. At that speed, the clutch engages and the engine and generator then accelerate automatically to a rated speed of 4,400 r.p.m. Source: **Perkins Gas Turbines, Ltd., Peterborough, Northants, England.**

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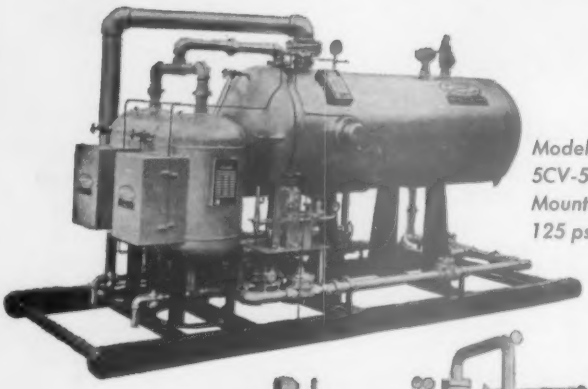

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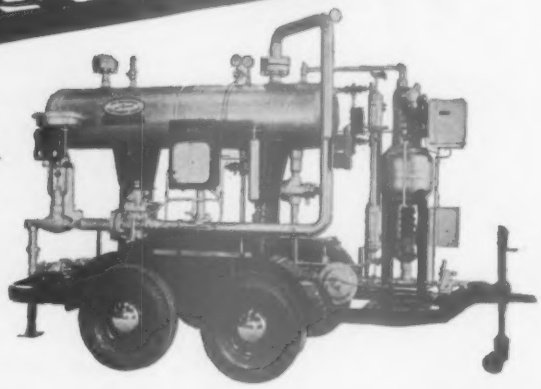

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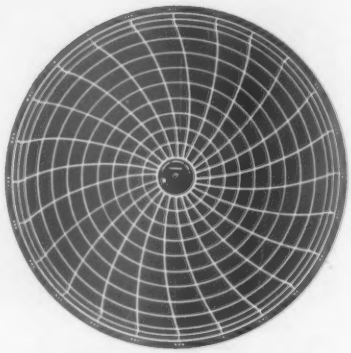

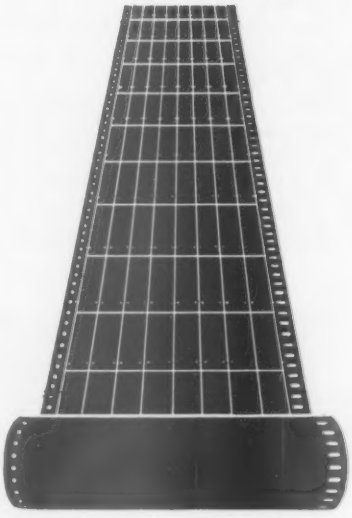

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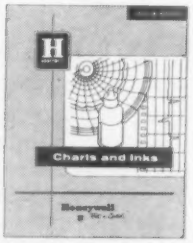

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tion losses as the older type and that the newer ones have a slightly higher bulk density. These features permit molecular-sieve adsorption systems to be designed for more stringent operating conditions and high flow rates.

The molecular sieves can be used for hydrocarbon sweetening, gas drying, gas purification, and other related applications. According to the maker, this type of molecular sieve is especially useful in the refining and natural-gas industries for sweetening liquid hydrocarbons, particularly propane and butane. Source: **Linde Co., 30 East 42nd, New York 17, N. Y., U.S.A.**

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Hydraulic-powered tong

. . . for tubing measures only 42 in. long and 29 in. wide and is designed to give the speed and efficiency needed for well-servicing operations. Features of the Model 4600-H tong include front-end controls to minimize operating time, a planetary type of gear box, bronze drag shoe, snapout stainless-steel jaw pins easily released by a push on a center button, and simple jaw changeover that fits the tong to various tubing sizes. The tong is available to handle tubing sizes from 1.050 to 4½-in. o.d. An optional backup accessory is available for use on both the coupling and on the pipe. Source: **Hillman-Kelley Co., 1000 Macy St., Los Angeles 33, Calif., U.S.A.**

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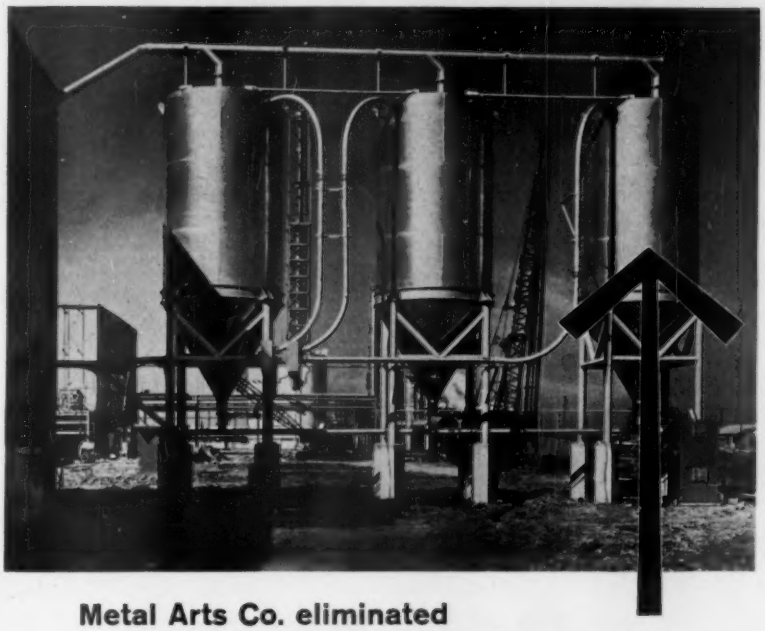

Metal Arts Co. eliminated product contamination in bins and piping at Koppers polyethylene plant

Originally selected for initial low cost, aluminum proved a good design specification for bins and conveyor piping at the Koppers plant, Port Arthur, Texas. Used in polyethylene production, these units have eliminated undesirable metallic contamination of the product — thanks to the chemical stability of aluminum. Bins were designed and fabricated by Metal Arts Co., Houston. Here, again, is a case in point showing a good design made still better by the valuable chemical and physical properties of ALCOA® Aluminum. The coupon will bring you detailed information on how to make improvements in your own good designs.

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The Oil and Gas Loan Department of The National Bank of Commerce is ready to help you now. There are many ways to help, and lending money is only one function of this department. The Oil and Gas specialists in this department have already helped so many others. They've helped them back on the road to a profitable operation by helping them tighten their organization, cut costs by paring fat and not muscle.

The time may well have come when you must start living under the new conditions in the oil business. There's no better way to get started than by beginning to work with the Oil and Gas Loan Department of The National Bank of Commerce.

The oil and gas business is going to be around for a long time to come. Our experience and knowledge of all business can help you to get over the next few years, can help you to keep your organization intact and in good shape. Knowing the oil and gas business is one more reason so many leading independents are with us now. They need the best in banking, and the best in banking costs no more.

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MAIN, TRAVIS AND CAPITOL

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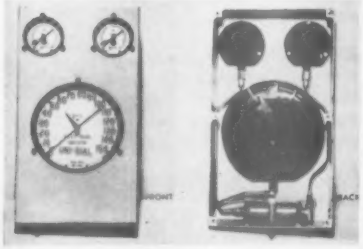
Flaws detected

. . . or thicknesses measured accurately with a new ultrasonic flaw detector now on the market. Features of this new Mark 3 instrument include a 5-in. display of fine definition and high brightness to prevent operator fatigue, a simple control panel, single, double, or combined probe working, and a camera adaptor for onsite inspection recording.

Weighing 28 lb., the detector measures 10¼ by 7¼ by 17 in. Where it is to be used for routine inspection, a contrast control may be brought into use to provide an extremely clean trace by contrasting small-defect echoes against spurious echoes received from grain boundaries. To avoid possible misuse of this facility, a warning light is illuminated when this control is used. Source: **Ultrasonoscope Co., Ltd., Sudbourne Rd., Brixton Hill, London, S.W. 2, England.**



Safer derricks

. . . for servicing and workover are promised through the use of this Model D Safety-Weight control indicator which gives hook-load readings on a 8½-in. dial. The instrument incorporates a memory flag

from ALCOA

good designs made better with aluminum

All-aluminum cooling system reduces danger of water contamination in Brookhaven's new Synchrotron

More than one mile of aluminum piping and some 2,600 FLOWLINE aluminum fittings comprise the magnet cooling system at Brookhaven National Laboratory's new Alternating Gradient Synchrotron. High-purity water at 65°F is circulated through an aluminum piping system to cool electromagnets arranged in a one-half mile long circular ring; the water is then returned to heat exchangers. Because the conductivity of the water must be kept below 11 micromhos, aluminum was selected for its superior resistance to corrosion. View of pump room above shows sections of aluminum piping; FLOWLINE tees, elbows, and reducers, made with ALCOA® Aluminum by Flowline Corp., New Castle, Pa. For more information about aluminum's applications and versatility, please send the coupon.

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Aluminum Company of America, 826-D Alcoa Building, Pittsburgh 19, Pa.

Please send me the following literature covering Alcoa Aluminum for tubular products and other uses in the process industries:

- ☐ 34-10197 Aluminum Pipe and Fittings
- ☐ 34-10418 Alcoa Unitrace: Combines Piping and Tracing in One Unit
- ☐ 68-10460 Process Industries Applications of Alcoa Aluminum
- ☐ 88-11453 Solving Refinery Corrosion Problems with Aluminum

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for fishing, milling, packer setting, and maximum limits for safe practices.

A load integrator adds the load from each derrick leg, regardless of variations due to wind, line string-up reaction, or rod and tubing loads stacked on the derrick. It provides a single-point reading for the hook load which is said to be free of these variations.

Individual 3½-in. dials indicate the derrick leg - load conditions. Memory flags indicate foundation conditions, wind loads on the derrick, and other stability conditions. Operating from hydraulic base pads, the indicator comes in capacities of 150,000 and 300,000 lb. Source: **Pennant, Inc., P. O. Box 55, Tulsa, Okla., U.S.A.**

●

Full-passage check valve

. . . designed to let pigs, scrapers, and rubber - ball separators pass. When the check valve is open, the bonnet cavity is sealed off. This feature is said to prevent turbulence and pressure drop. A "finger" is cast to the clapper. It goes through a slot in the valve arm and brings the clapper up straight against a seat when the valve is open. Available in cast steel and ductile iron, the valve comes in sizes from 2 to 36 in. and in ratings from ASA 150 through ASA 2500. Source: **Tom Wheatley Co., P. O. Box 2094, Houston 1, Tex., U.S.A.**

●

Metal primed without sandblasting

. . . with a new virtually all-solids field primer recently developed. The product, V-54 primer, has unusual wetting properties which reportedly permit it to be used over sound, hand-cleaned metal. A red-lead and zinc-chromate type of primer, the product permits a high film build (4 to 6 mils) in one brush, roller, or spray coat out of the package as received, the maker says.

In combination with the primer,

MARTIN RUBBER & DUCK RINGS give excellent life in dirty abrasive fluids . . . high or low gravity . . . much or little water . . . shallow or deep wells. They last for years in the easier pumping wells. Replacement rings cost comparatively little.

MARTIN PLUNGER BODIES, precision grooved, drilled and threaded (no underneath fluid passage), usually last for years. Tube or barrel costs are often cut in half.

The replaceable SYNTHETIC RUBBER GUIDES in MARTIN CAGES last longer than any metal, and the cushioning of the ball increases your ball & seat life. Results are often truly amazing. (Patent No. 2,591,174)

Write for our new catalog or see it in the Composite (24th Edition). All products sold thru supply companies.

JOHN N. MARTIN
Manufacturer
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What makes the first gear-type coupling still first choice?

Check design . . . and you'll find Fast's Couplings (the original gear-type couplings) are superbly engineered, ruggedly built, smoothly running units designed to outlast the machines they connect.

Check completeness of line . . . and you'll find Fast's Couplings come in a complete range of sizes and types for shafts from ½" to 32" and larger.

Check service . . . and you'll find Fast's Couplings are backed by expert help from experienced field engineers . . . while outstanding stock facilities throughout the country insure speedy delivery of your coupling orders.

Check popularity . . . and you'll find Fast's Couplings are the choice of more industrial equipment manufacturers than any other shaft coupling.

Check Fast's for your coupling needs today.

KOPPERS COMPANY, INC., 1404 Scott St., Baltimore 3, Md.

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epoxy and vinyl coatings that normally require sandblasted substrates can be used in areas where there is a need for their chemical resistance but where sandblasting is not practical, according to the maker.

Drying time is about 7 to 16 hours at 4 to 6-mil thickness and at temperatures above 50° F. Potential uses include tanker interiors, hulls, and decks, and surfaces where sandblasting can't be done because of an explosion hazard, equipment fouling, or product contamination. Source: **Du Pont Co., Room D-7035, Wilmington 98, Del., U.S.A.**

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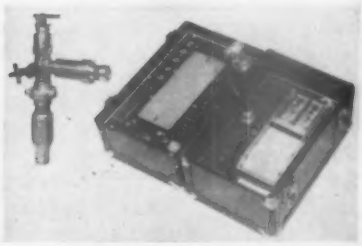


Compact well sounder

. . . an acoustic type is designed to conform to the small trunk space in some of the modern cars. The amplifier-recorder of the Model D-3 Sololog well sounder measures only 12 in. and weighs only 41 lb.

The microphone is a shatterproof ceramic style. Two separate recording channels are provided. Source: **Keystone Development Corp., 2813 Westheimer Rd., Houston, Tex., U.S.A.**

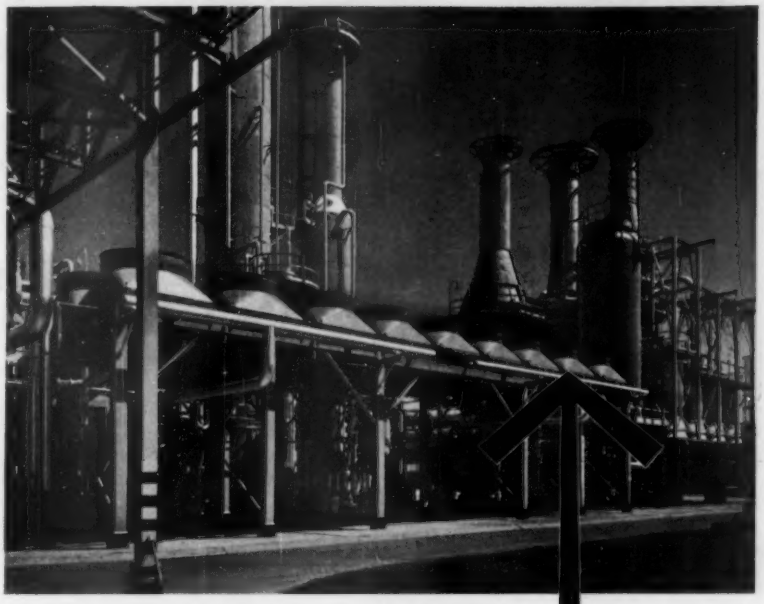
●

Three-in. valve for 1,000 psi.

. . . features a special gland packing consisting of two O-rings housed in a screwed, carbon-steel bushing. If the O-rings fail, the gland can be effectively sealed temporarily by bringing an emergency seal into service. This is done by loosening a bushing lock nut and screwing the bushing tightly down. This action compresses the rubber and asbestos rings at the bottom of the stuffing box. The lock nut is then tightened. The valve is made of cast steel. Source: **Newman Hender (Canada), Ltd., 4 Bestobell Rd., Toronto 14, Ontario, Canada.**

from ALCOA

good designs made better with aluminum



improves process cooling rate, resists corrosion at Southwestern Oil & Refining Company's Big Texas Refinery

Aluminum's superior ability to transfer heat finds practical employment in this Solo-Aire cooling installation, made with ALCOA® Aluminum by Hudson Engineering Corporation, Houston, Texas. Light, bright aluminum has other advantages here: notable corrosion resistance and remarkable low-temperature properties. Installed at Corpus Christi, Solo-Aire is clear evidence of another good design made better with aluminum. Perhaps ALCOA can help improve your good designs. For more information, please mail the coupon.

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- ☐ 68-10460 Process Industries Applications of Alcoa Aluminum
- ☐ 88-11453 Solving Refinery Corrosion Problems with Aluminum
- ☐ 02-19051 Alcoa Aluminum Handbook
- ☐ 42-20849 Resistance of Aluminum Alloys to Weathering and Resistance of Aluminum Alloys to Chemically Contaminated Atmospheres
- ☐ 34-20437 Aluminum Alloy Heat Exchangers in the Process Industries

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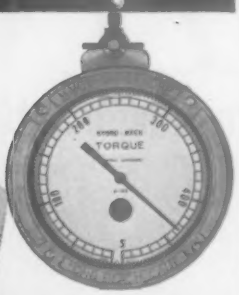
ROTARY TORQUE

for DOWN HOLE VISION



A good Weight Indicator is not enough. For complete knowledge of down hole conditions install the Martin-Decker Hydro-Mech Torque Assembly. This unit fits under the rotary or secondary chain and provides sensitive indications of:
Hole and Bit Conditions
Fishing Operations
Diamond Coring
Air and Gas Drilling

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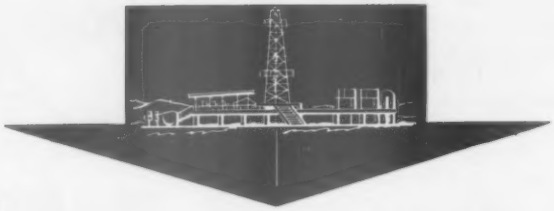
3431 CHERRY AVENUE, LONG BEACH 7, CALIF.

World's principal manufacturer of Oil Well Drilling Instrumentation



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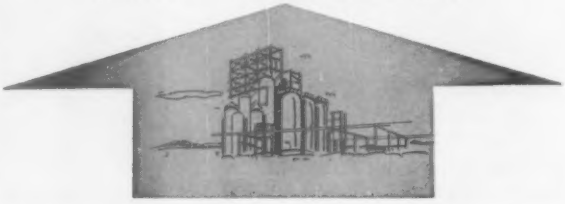
LOUISIANA'S OLDEST BANK

OIL AND GAS DEPARTMENT
ROBERT F. CASHEN *Assistant Vice President and Manager*



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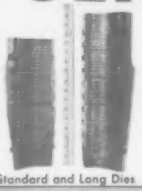
KELCO **POWER SLIPS**

Slip bowl assures positive alignment of the slips with drill pipe. Eliminates "Bottlenecking". KelCo's safety latch *works!*

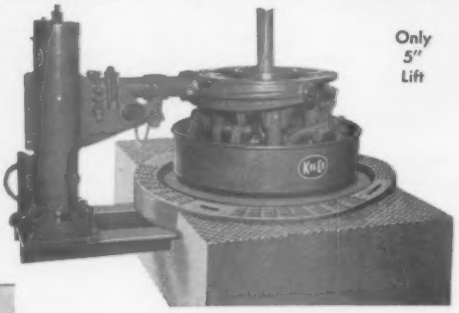
Available Through Your Preferred Supply Store

Write For Free Catalog and Price List



Standard and Long Dies

KelCo's Standard and Long Dies Give More Pipe Contact



Only 5" Lift

Model J-6 (Illustrated)
Model J-6-J Slim-Hole Power Slips Also Available

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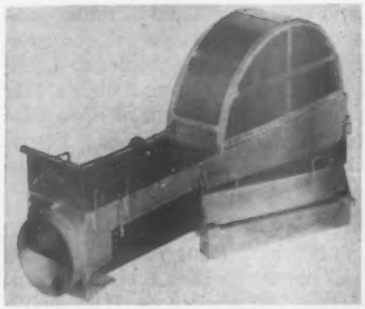

Steel removed from mud

. . . with this Model F Ditch Magnet developed specifically for magnetic removal of steel cuttings from a drilling-mud system. It's installed in the mud system between the shale shaker and the working pits. As the mud flows through it, the magnet removes the metal particles suspended in the mud.

Adjustable wings at the unit's entrance direct mud through the housing in which a strong magnet is suspended. Cuttings removed from the mud are automatically discharged from the side of the unit into a removable hopper. Mud flow controls rotation of the magnetic element. Source: **K & G Oil Tool & Service Co., Inc., 2703 Sackett, Houston 6, Tex., U.S.A.**

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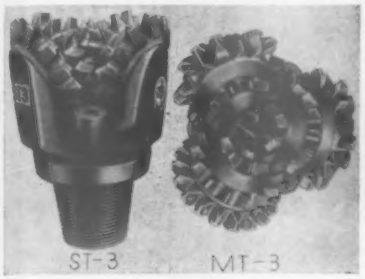


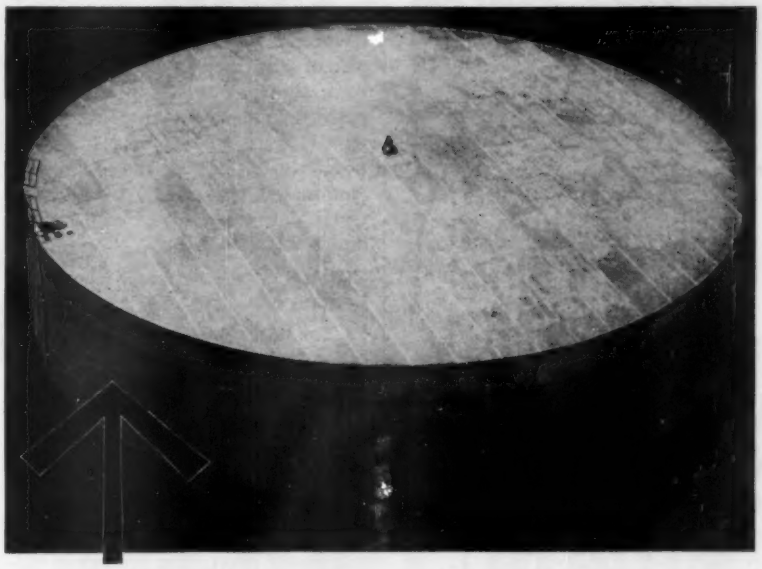
Faster drilling promised

. . . with a new line of rock bits which the maker claims offers a way to faster drilling and straighter holes. The maker says the ST-3 rock bits maintain a straight hole when going through streaks interspersed with soft formation.

A companion line of rock bits, Model MT-3, are also claimed to drill faster in the harder formations and to retain their gage while maintaining a high rate of penetration. They, too, are available in both regular and jet types. Source: **Globe Oil Tools Co., 11630 Burke, Los Nietos, Calif., U.S.A.**

from ALCOA

good designs made better with aluminum



ensures uninterrupted storage of 83% ammonium nitrate at 180°F for Armour Agricultural Chemical Co.

Here you see the world's largest all-aluminum storage tank. Field-erected by Chicago Bridge & Iron Co. at the Selma, Mo., plant of Armour Agricultural Chemical Co., it holds ammonium nitrate at 180°F with minimum down time recorded since 1955. The reason for this is the unmatched ability of aluminum to resist the corrosive attack of the stored solution — and the surrounding atmosphere, as well. 26 ft high and 128 ft in diameter, the tank represents one more good design made still better by the matchless qualities of aluminum. Mail the coupon and discover how you can improve your own good designs with ALCOA® Aluminum.

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- ☐ 68-10460 Process Industries Applications of Alcoa Aluminum
- ☐ 50-19415 Welding Alcoa Aluminum
- ☐ 02-19051 Alcoa Aluminum Handbook
- ☐ 42-20849 Resistance of Aluminum Alloys to Weathering and Resistance of Aluminum Alloys to Chemically Contaminated Atmospheres

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Breeding potential fire hazards? Suffering high evaporation losses? Reblending to produce desired end product? Material and time losses reducing your profits? B-I-F continuous, automatic in-line blenders eliminate these problems. Improve tank utilization . . . and in a single pass, produce stable end products of predetermined viscosity direct to truck transport right at your loading dock. B-I-F Asphalt Blending installations are accepted by most state inspection authorities.

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If you want to clean up your operation, increase efficiency, assure economical operation using a single operator who can reproduce any desired blend by simply adjusting one master ratio control, write for details. Free facts sent upon request.

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What's NEW

. . . in literature

Power slush pump

. . . specifications, features, and performance are given in new 12-page Bulletin 520 now available. The bulletin presents the K-380 pump of 380 input hp., and describes its design for ruggedness with low weight and small size. The literature shows provisions for better performance and simpler maintenance than the maker's earlier pumps of this capacity. Source: **National Supply Div., Armco Steel Corp., Two Gateway Center, Pittsburgh 22, Pa., U.S.A.**

Immersion heaters

. . . for heating asphalt, Bunker "C" oil, and other liquids in tanks for loading, pumping, blending, or storage, are illustrated in Bulletin 410, which shows how the units provide dependable tank heating without steam. The units are directly fired by gas or oil to eliminate installing boiler capacity, piping, and installation. The four-page bulletin contains a table of dimensions and specifications on two conventional sizes with capacities to 1,250 M. B.t.u. per hour, and higher with multiple units. Source: **Brown Fintube Co., 300 Huron St., Elyria, Ohio, U.S.A.**

Slim-hole tubing

. . . brochure (four pages) describes and illustrates T&C tubing for multiple-completion wells. The publication presents dimensions, pressures, minimum-performance properties, and setting depths of the tubing in three grades and three sizes—2⅛, 2⅜, and 2⅞-in. o.d. Source: **Jones & Laughlin Steel Corp., Three Gateway Center, Pittsburgh 30, Pa., U.S.A.**

Pipeline coatings

. . . consisting of primers and enamels are described in new illustrated Bulletin T-204 now available. Divided into three sections, the 16-page bulletin includes a color-coded enamel selector as an aid in picking the correct protective-coating system for specific ranges of field conditions. One section describes facts

WHEN YOU NEED HELP IN A HURRY—

Koppers coupling service cuts costly down-time

Not every coupling service need is an emergency. But it's the emergencies that really test a good organization. That's why Koppers maintains experienced field engineers and outstanding stock facilities throughout the country. In addition, if it's a Fast's Coupling you're replacing, we have a serial number and specific application history for every Fast's for easy reordering. And our modern manufacturing facilities have the extra capacity to lick an emergency for special requirements.

Example: A modern windowless bank in Georgia was able to open for business as usual only because Koppers flew in a completed replacement coupling for its air conditioning unit. Elapsed time . . . request phoned to Baltimore after 10 in the evening . . . coupling arrived before 7:30 next morning.

KOPPERS COMPANY, INC., 1404 Scott St., Baltimore 3, Md.

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FAST'S COUPLINGS
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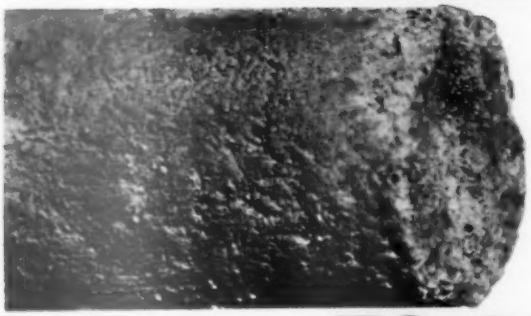
NEW SCHLUMBERGER BULLET DESIGN

EXTENDS SIDEWALL CORING



TO 20,000 FEET!

A new improvement in bullet design has made practical — for the first time — sidewall coring at 20,000 feet.

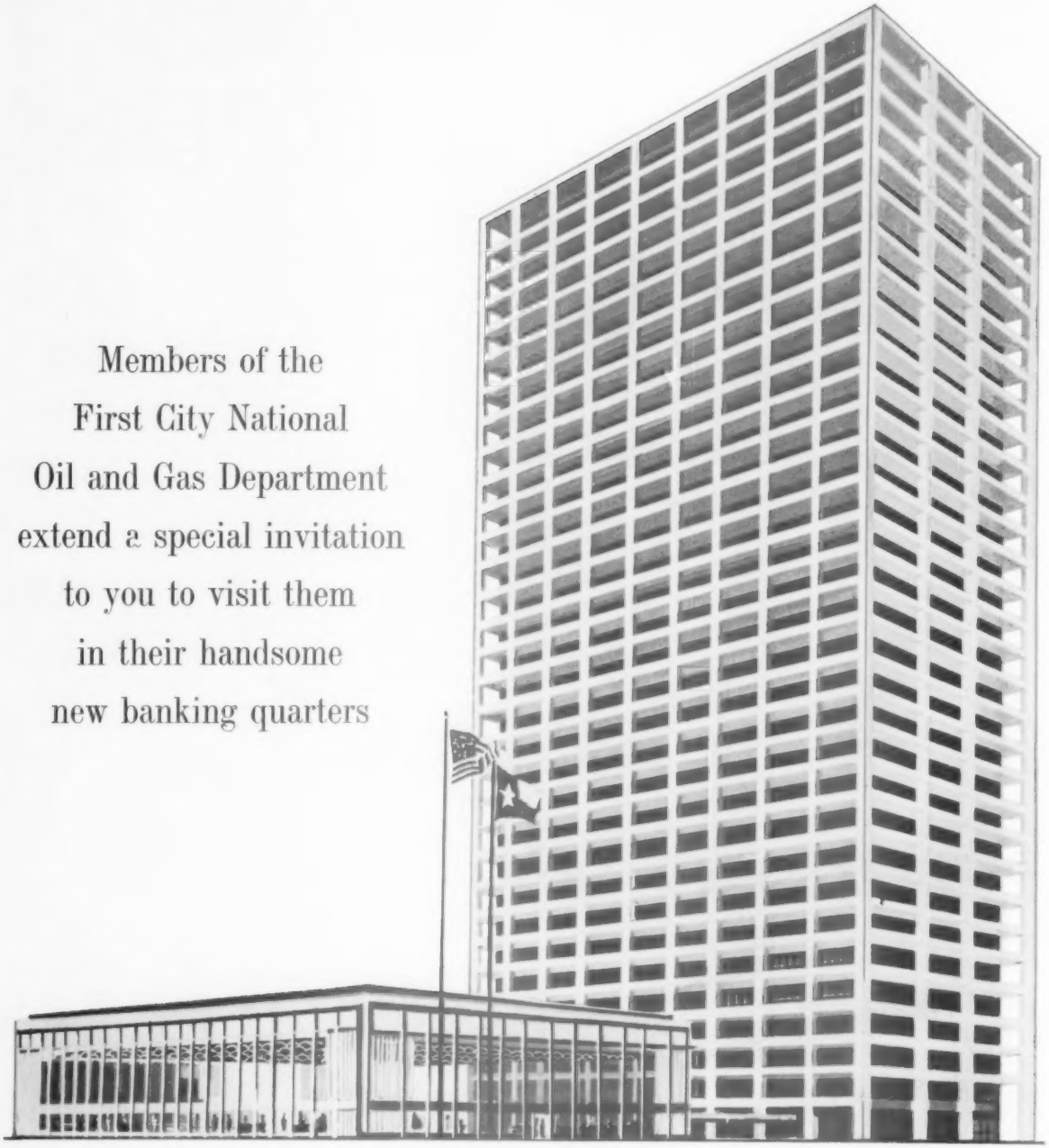
At all depths the new bullet has provided cleaner, less altered cores to enable better laboratory analysis. Improved percentage of recovery has reduced the number of runs required and, thus, has reduced rig time.

This is another example of the persistent efforts of Schlumberger engineering. Tools and Services, both new and old, are constantly improved to do an even better job for the oil operator.

SCHLUMBERGER

THE EYES OF THE OIL INDUSTRY®

Members of the
First City National
Oil and Gas Department
extend a special invitation
to you to visit them
in their handsome
new banking quarters



the new
FIRST CITY NATIONAL BANK *of Houston*

MEMBER FEDERAL DEPOSIT INSURANCE CORPORATION

behind the protective properties of coal-tar-base enamels and illustrates their use in a number of applications. Source: **Tar Products Div., Koppers Co., Inc., Koppers Bldg., Pittsburgh 19, Pa., U.S.A.**

Methods of detection

. . . for pipeline interfaces by nuclear density-gaging systems along with 13 other petroleum-industry applications, are outlined in two-page Bulletin IF-2. It presents a short discussion of present interface-detection systems compared with the automatic nuclear system. The bulletin includes 13 additional applications with specific installation and operational data. Source: **Ohmart Corp., 2236 Bogen St., Cincinnati 22, Ohio, U.S.A.**

Oil-field services

. . . Bulletin 10 presents four pages of general facts and information on water - well systems, water pumps, water-well drilling, and allied services and equipment for industrial use. Additional bulletins are listed for detailed information on water-well drilling, well casing and screen, pumps, chemical treatment of water wells, and water treatment. Source: **Layne & Bowler, Inc., Box 6697, Hollywood Station, Memphis 8, Tenn., U.S.A.**

Gas-lift systems

. . . of the closed-rotation type, are described in obtainable Bulletin 1260. Included are diagrams of several types of installations which successfully use this method of gas lift without large gas wells. Source: **Merla Tool Corp., Box 2576, Dallas 21, Tex., U.S.A.**

Floodlight bulletin

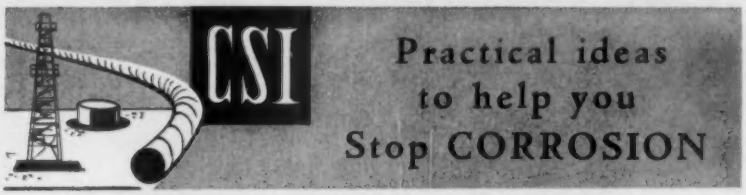
. . . presents a series of five Intenso "Econoflood" floodlights recently put on the market. Bulletin EFL-960 describes in detail the dual-reflector system for stepped-up "illumenpower," which is said to release more light usually trapped in the other reflector housing. Also illustrated is a complete set of accessories for base, pipe, pole, or vertical-surface mounting. Source: **Appleton Electric Co., 1701 W. Wellington Ave., Chicago 13, Ill., U.S.A.**

Data on pipe wrap

. . . offered in a new catalog gives details on Fiberglas inner and outer underground pipe wraps. Microphotos show how glass yarns and fibers are bonded to make tough and resilient Fiberglas pipe wraps. Other photos illustrate application techniques. Technical tables serve as a guide to the proper thicknesses, widths, laps, and other information necessary for specific jobs. The charts include dimensions, physical properties, and other specifications of pipe - wrap products. Source: **Owens-Corning Fiberglas International, S.A., 717 Fifth Ave., New York City, N. Y., U.S.A.**

Waste-heat recovery

. . . from internal - combustion engines, is the topic of a 24-page illustrated technical article, yours for the asking. Schematic layouts are used to illustrate various applications. Included are specification descriptions to assist in developing bids. Source: **J. B. Beaird Co., Inc., 6200 St. Vincent Ave., Shreveport, La., U.S.A.**



HOW YOU SAVE MONEY BY USING "HIGH POTENTIAL" RATHER THAN "STANDARD" MAGNESIUM ANODES

Why do you use magnesium anodes to stop corrosion of pipe lines, tank bottoms, oil well casing, etc.—rather than other types of galvanic anodes that sell for less money per pound?

The answer is, of course, because magnesium gives you a lower overall cost for cathodic protection. Magnesium's higher potential (approximately 0.4 volts) makes it possible to achieve protection with fewer installations.

If the above is true, then it follows that a "high potential" magnesium anode (delivering approximately 0.3 volts more than regular magnesium) can give you an even lower overall cost. This would be especially true if there is no sacrifice in useful ampere hours of current per pound.

Galvomag, the high-potential magnesium anode developed by The Dow Chemical Company, meets both of these requirements: It delivers 20 to 35 per cent more current than standard H-1 alloy magnesium anodes; and it has a current efficiency (ampere hour rating) comparable to H-1 anodes. Other so-called "high potential" and "high current" anodes tested however, do not show current efficiencies in a comparable range.

To help you get the most for your magnesium anode dollar, we suggest that you specify Galvomag or its equivalent in solution potential and ampere hour rating.

CSI engineers—pioneers in cathodic protection—have also developed a wide variety of special sizes and shapes to make Galvomag even more efficient. For example, the use of these special sizes in "hot spot" protection of pipe lines makes it possible to lower the number of anodes required by one-third—without decreasing the amount of protection or shortening the life of the installation.

It will pay you to check with CSI—for expert engineering and installation services, plus a complete line of cathodic protection supplies for both rectifier and anode installations. Prices are competitive. Call or write today.

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▶ ▶ ▶ Equipment Men Notes

Federal-Mogul Service shifts

. . . R. Ryrie Smith to San Francisco district manager and promotes Charles H. Murphy to acting Calgary district manager, following the retirement of Edward Jackson, former San Francisco manager. Smith, manager of the Calgary district since 1956, joined the organization as a trainee in 1950.

Murphy goes to Calgary from his position as salesman in the Hartford, Conn. district. He transferred to the service division from a sales post with the National Seal Division in 1957. Jackson retires after 26 years with Federal-Mogul Service Division, virtually all of which had been with the San Francisco district. He joined the organization there in 1934 and had served as district manager since 1942.

Axelson-Garrett promotes four

. . . in the management staff of the division's sales department. All will locate in Houston. J. P. Nielsen, advanced to manager of product sales, will be responsible for sales activities for pumps and sucker rods in the United States and Canada. W. K. Woodward, new manager of sales administration, will supervise overall material controls, sales engineering, and export sales.

Neal V. Fowler, promoted to manager of industrial sales, will be in charge of world-wide sales of relief valves and government and special contract sales. R. V. McAfee, appointed manager of sales promotion and training, will include in his jurisdiction the functions of advertising and sales promotion, sales training, market research, and analysis.

Ralph L. Boyer becomes v.p.

. . . of advanced planning for Cooper Bessemer Corp., moving up from his former post of vice president and director of engineering. In his new position Boyer will devote full time to advance product planning, while studying products that might contribute to C-B's diversification program.

R. L. Boyer

Internuclear Co. establishes

. . . a computer application division and names E. Edward Mason as manager. The Clayton, Mo., company is a subsidiary of Petrolite Corp., of St. Louis. The division will be concerned with the application of electronic-computing equipment for the petroleum and chemical industries. It will also provide services where high-speed digital computers are used in the solutions of engineering problems.

SALES PERSONNEL from Mission Mfg. Co.'s western, Mid-Continent, and West Texas-New Mexico districts convened in Denver recently for a two-day meeting, reviewing sales activity of last year and firming up plans for this year's program. Among the oil-tool-manufacturer's salesmen attending the tri-district meet were, left to right, first row: John Bannister, J. S. Stewart, T. R. Fullinwider, R. E. White, C. O. Bartley, C. E. Van Loozen, J. H. Brown, and C. W. Fryar. Second row: Hugh Morris, Garland Kennon, R. E. Hardy, L. M. Krausse, Joe Weaver, R. E. Wood, Paul Chisholm, Leon Couch, Don Greenlaw, Keith Snyder, Joe Young, and Tony Volotko. Third row: Lloyd Bahr, Henry Lee, Bernard McCann, Harvey Durham, James A. Groves, Dean Hallum, J. W. Patterson, W. N. Brown, and W. Y. Cadwallader.

Kenneth Grover assumes post

. . . as field sales specialist for Joy Mfg. Co.'s turbodynamic products in Oregon, Washington, and California. These products include centrifugal and axial compressors and expander turbines. Grover will be stationed at Joy's district office in Los Angeles.

Grover has 14 years' experience in designing, testing, servicing, and selling turbodynamic machinery. Previously he was with Carrier-Elliot Corp. as sales engineer and service manager in New York City, and most recently as district sales manager in Buffalo.

A. Clark Daugherty takes over

. . . as vice president of Republic Flow Meters Co., subsidiary of Rockwell Mfg. Co. Prior to this, Daugherty was executive assistant to Republic President W. F. Crawford for 4 years. He is also a director of Republic and a vice president and director of Republic Flow Meters Canada, Ltd.

A. C. Daugherty

Other Rockwell appointments include: Thomas J. Williams, now branch manager of the El Paso office, and Eldon E. Carlson, named western product manager for Rockwell's Petroleum & Industrial Meter Division, with headquarters in Pittsburgh.

Dean Goss is district manager

. . . for Dayton Industrial Products Co., handling industrial V-belt drives and hose sales with headquarters in Oklahoma City. The announcement was made by N. G. Lever, Industrial sales manager. Goss was formerly associated with his father at Goss Aircraft Supplies, Dallas.

Baker opens new branch office

. . . and warehouse in McComb, Miss.—the 70th operating location the company has in the United States, the third in Mississippi. F. T. Taylor has been transferred from

Look at It

...each way you save with MISSION PISTONS

Every minute that it's working, the Mission Piston is working for you. Working to cut your pumping costs, working to cut your downtime. Here's why: These bodies are lightweight, one-piece *forgings;* yet they're strong enough to resist extremely high pump pressures. The special fabric backing of the rubber compounds provides just the right degree of reinforcement for maximum piston rubber life.

The three long-life piston rubber compounds available are designed for your specific drilling operations to save you the most. Plus, these rubbers are replaceable, saving about half the cost. And you can replace them without removing the piston, saving even more. Mission pistons are the standard, because of Mission engineering, Mission quality control, and the Mission guarantee.

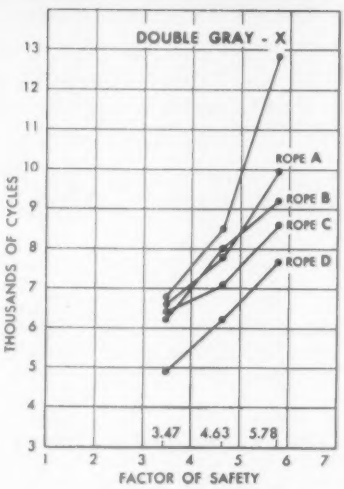
MISSION MANUFACTURING CO. P. O. Box 4209, Houston, Texas • Cable Address 'MISSCO'
Export Office: 30 Rockefeller Plaza, New York • In the United Kingdom: MISSION MANUFACTURING CO., LTD., 1 Hanover Square, London W. 1 England • cable address 'MISSOMAN'

MISSION MANUFACTURING CO.

CF&I-Wickwire is making the wire rope of *tomorrow... today*. It's Double Gray-X —the rope with the molecular shield of molybdenum disulphide.

In an extended series of tests on a 25,000-lb. fatigue machine, CF&I-Wickwire's Double Gray-X outlasted four other major brands of high-strength rope at all three of the safety factors used. At the highest and most commonly-used safety factor, Double Gray-X had 45% more bending life than the average of other ropes tested. (Please see the chart at right.)

We'd like to give you some additional information on these tests . . . let you read some enthusiastic field reports from satisfied users . . . and show you how the molecular shield on Double Gray-X can help reduce your equipment-downtime costs. Contact your nearby CF&I sales office or distributor today.



All test ropes were ½" 6 x 25 FW Preformed E.I.P.S. Lang Lay IWRC.

THE COLORADO FUEL AND IRON CORPORATION
Denver • Oakland • New York
Sales Offices in Key Cities

CF&I STEEL MADE IN U.S.A.

West Texas to manage the McComb branch.

Taylor joined Baker Oil Tools, Inc. nearly 10 years ago and since has worked as an oil-field-service engineer in Kilgore and Odessa, Tex. Prior to his move to McComb, he held the post of sales and service engineer in Odessa.

Iverson Supply Co. announces

... the election of officers and directors at the company's recent stockholders meeting. New positions were announced for A. L.

A. L. Wallace

A. G. Evans-Lombe

Wallace, now executive vice president and secretary-treasurer, and A. G. Evans-Lombe, elevated to vice president in charge of sales. Wallace, who has been with Iverson more than 9 years, is located at the Tulsa home office. Evans-Lombe, who joined the firm last year, is located at the Fort Worth office.

Other officers elected include S. J. Iverson, Sr., president; P. D. Iverson, Sr., vice president; M. C. Niblack, vice president of sales; and E. L. Lambert, vice president of store and field operations.

Cantex Corp. is established

C. H. Dresser, Jr.

...as a fully owned subsidiary of Barnwell Offshore, Inc., of Shreveport. Charles H. (Chuck) Dresser, Jr., formerly with Milwhite Mud Sales Co., has been named executive vice president with offices in Houston. R. J. (Bill) Robbins, vice president and general manager of Barnwell Offshore, Inc., is president, and R. S. Barnwell, Jr., is chairman of the board. Cantex specializes in a loss-circulation material for mud systems with its feature product known as Pheno-Seal.

Robert R. Sloan assumes post

R. R. Sloan

...as general manager of Houston Engine & Pump Co., announces Thomas N. Hunt, president of Hunt Tool Co., of Houston. In addition to acquiring new lines of equipment for distribution, Sloan will intensify a program to increase the number of Hepco dealers throughout the South. Prior to joining Hepco, Sloan was with National Supply where, for the past 4 years, he served as plant engineer and staff assistant to the works manager.

Continental-Emsco Co. holds

... its 20th annual sales meeting at the Sheraton Dallas Hotel in Dallas. More than 350 employes from the United States, Canada, and England were in attendance, as the meeting was held in conjunction with C-E's

"Matched Tools for Unmatched Performance"

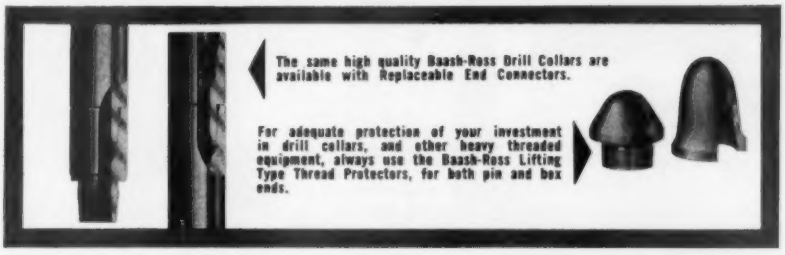
BAASH-ROSS TRUBORE DRILL COLLARS

. . . SUPERIOR QUALITIES Keep Them FIRST!!

- Baash-Ross Drill Collars are stress relieved to prevent bending in operation due to internal stresses.
- Specified chemical analyses and heat treat processes result in mechanical properties 1" below the surface which insure maximum joint strength.
- Impact tested to assure attainment of the desired metallurgical characteristics.

Thru the years these qualities of Baash-Ross Drill Collars have proven to be essential for maximum Collar life.

For additional information, write for Bulletin D1


The same high quality Baash-Ross Drill Collars are available with Replaceable End Connectors.
For adequate protection of your investment in drill collars, and other heavy threaded equipment, always use the Baash-Ross Lifting Type Thread Protectors, for both pin and box ends.

Call us for Your *Rental and Service* Needs
. . . available in most areas.

OUR 42d YEAR OF PROGRESS

BAASH-ROSS

DIVISION OF JOY MANUFACTURING COMPANY

General Offices: Houston, Texas

affiliated manufacturers whose products the company distributes worldwide. The three-day session included tours of Continental-Emsco's general offices in Dallas and its subsurface equipment plant in Garland, Tex.

A. James Johnston, Jr. named

. . . assistant to the manager of the organic chemicals section, Solvay Process Division, Allied Chemical Corp., according to Verne Aubel, Jr., director of sales. Johnston joined Solvay in 1953 as a salesman at the St. Louis branch. He was assigned to the Charlotte, N. C. territory in 1957.

A. W. Hail named representative

. . . for tubular products of Jones & Laughlin Supply Division at Dallas, according to W. L. Wolfe, vice president in charge of sales. Hail started with J&L at Houston 10 years ago. He was promoted to salesman in 1954, and was transferred to the division's Dallas city sales office in 1955.

William C. French, Jr. named

W. C. French, Jr.

. . . general manager of sales for U. S. Steel's National Tube Division, according to Robert E. Williams, vice president of sales. French, who had been sales manager of National Tube's eastern area, succeeds Louis W. Mason who retired after more than 37 years with U. S. Steel Corp.

French joined National Tube as a sales trainee in 1948, was assigned as a salesman in the Indianapolis area, and in 1950 moved to Pittsburgh as manager of market development. In 1952 he was made manager of sales in St. Louis, and in 1955 was transferred to Chicago as manager of sales. He assumed his position as eastern area manager in New York City last year.

Charles Radden joins Foxboro

. . . to work in the company's newly formed marketing division where he will be in charge of chemical-industry promotion for both United States and international markets. Radden previously worked for Boston Edison Co., Gulf Oil, E. I. du Pont de Nemours, Monsanto Chemical, and Arthur D. Little Co.

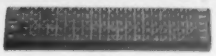
"Matched Tools for Unmatched Performance"

Web Wilson Sabre-Tooth Tong Dies

GRIP SECURELY-- TIME AFTER TIME

Choice of the industry, Sabre-Tooth Tong Dies are made from *triple-alloy* steel, heat treated in an advanced, carefully controlled process which adds carbon for a *hard exterior*, but leaves a tough resilient core. Angular teeth prevent deep biting, which protects the pipe. The *reversible feature* means longer die life. Corrosion is resisted by cadmium plating. Available for all sizes of tongs.

■ Specify *Web Wilson Sabre-Tooth Tong Dies* on your next order, and you too will recognize why they are the preference of the majority.



The popular Tiger Tooth Tong Die meets the same high metallurgical standards and is cadmium plated for corrosion protection.

"Jiffy" Tong-Die Driver and Slot Conditioner with its overhanging protective shield prevents flying chips, and automatically cleans the slot for the new die.

Web Wilson Tongs of all types are available for full range of sizes.

Call us for Your *Rental and Service* Needs . . . available in most areas.

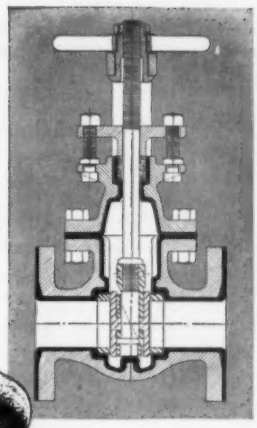
OUR 42d YEAR OF PROGRESS

BAASH-ROSS

DIVISION OF JOY MANUFACTURING COMPANY

General Offices: Houston, Texas

HOUSTON NOMAD REGENTS have been chosen by the Nomads National Board of Regents as its top officers for 1961. From left are: John W. Gates, Well Equipment Mfg. Co., treasurer; Ed W. Louden, Baroid Division of National Lead Co., chairman; and Basil H. Pickard, Plastic Applicators, Inc., secretary.



Darling rubber-lined (heavy lines) iron body gate valves with special alloy working parts provide trouble-free operation in many corrosive and abrasive services.

YOU CAN DEPEND ON

Darling

Darling rubber-lined iron body gate valves eliminate the need for expensive special alloy valves in many different applications.

The hard rubber lining on bodies and bonnets provides high resistance to corrosion and abrasion in services up to 180° F. and working pressures up to 150 lbs. The revolving double disc parallel seat and wedge construction minimizes friction, avoids wear concentrations, and automatically compensates for any valve seat deflection. *You can depend on Darling* rubber-lined iron body gate valves for maximum efficiency at minimum cost.

Darling rubber-lined iron body gate valves in rising stem, cylinder or motor operated, and quick-opening types, as well as rubber-lined iron body check valves, are available in sizes from 2" to 24". Write, wire or phone for bulletins.

DARLING VALVE & MANUFACTURING COMPANY
Williamsport 1, Pa.

Sandilands Valve Manufacturing Co., Ltd., Galt 19, Ontario, Canada
Vannes Darling-France, 23 rue du Commandant Mouchotte, St. Mandé, France

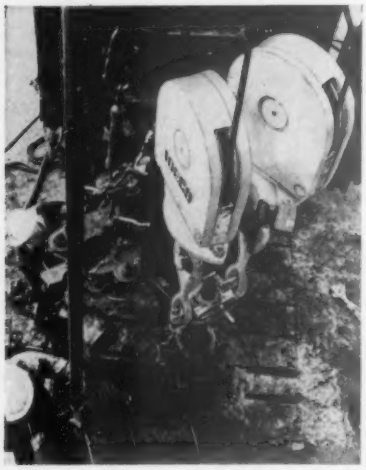
TRADE DARLING MARK

GATE • BUTTERFLY • CHECK • SPECIAL VALVES • FIRE HYDRANTS

Ideco Dual-Speed System . . .

Saves 30% to 50% Trip Time!

Running or pulling four 30′ stands of tubing a minute has proved to be average time for a rig equipped with the Ideco Dual-Speed System. Field reports from Texas and California indicate that the system will reduce by 30 to 50 percent the time normally required to round trip a string of tubing.



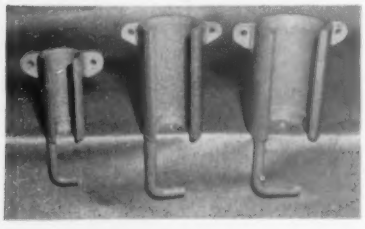
DUAL-SPEED BLOCK is hoisting another stand as freed stand is being racked.

Major Advantages

The Dual-Speed System has proved to be faster, safer and more economical than the conventional method. Crews working with the system say they work faster, but the work is much easier. After one round trip, average crews are proficient in operating the Dual-Speed System and they are enthusiastic about the ease of operation.

Basic Equipment

The Ideco Dual-Speed System utilizes a divided-type traveling block with an "Open-Swivel" link adapter, automatic elevators, and a transfer elevator.



TRANSFER ELEVATORS are available for various sizes of tubing and pipe.

Trip time is greatly reduced because the traveling block and elevators move up and down in almost continuous motion. This eliminates the time required with a conventional system when making or breaking a connection. The transfer elevator supports the pipe when "setting-back or stabbing" a joint.

The Dual-Speed System is available with either two or three-sheave blocks equipped with Ideco Fabriform sheaves mounted on Timken tapered roller bearings. The "Open-Swivel" adapter has an 8½″ front opening and a 12″ diameter center bore that allows sufficient space for running tubing, gas-lift valves, tools and other equipment. The swivel adapter can be rotated 360 degrees and can be locked in seven positions.

AUTOMATIC ELEVATORS remain around tubing at all times during trip.

Principles of Operation

In coming out of the hole, a stand is hoisted, the slips are set, and the traveling block started down while the crew is breaking out the joint. The automatic elevators remain around the tubing at all times. As the traveling block is falling, the derrick man slips the transfer elevator around the stand. As soon as the elevator passes the broken out joint, the tong man actuates the hydraulically-operated transfer elevator. This lifts the freed stand out of the collar and allows it to be set back in the racking platform while another stand is being hoisted by the Dual-Speed Block. The procedure is reversed when going in the hole.

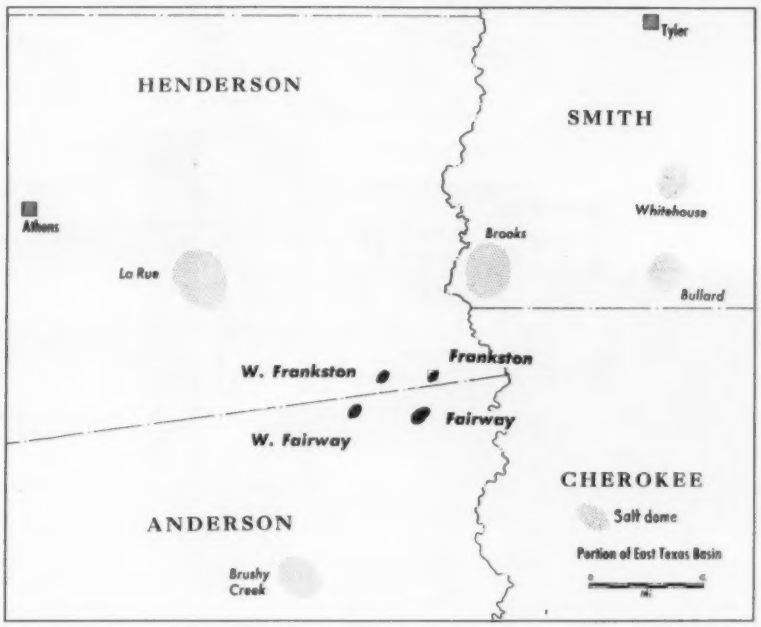
COMING OUT OF THE HOLE . . . traveling block is on the way down as the 60′ stand is being broken out on this "doubles" mast. Derrick man is attaching transfer elevator.

Idle block time is reduced almost to zero, for the pipe is not supported by the traveling block while a connection is being made or broken.

Ask the Ideco representative in your area to show you the DUAL-SPEED SYSTEM motion picture field report.

IDECO®

Division of Dresser Industries, Inc.
P. O. Box 1331, Dallas 21, Texas



DATA ON
ACTIVE FIELDS

Fairway area, East Texas

1. Approved field names: Fairway, West Fairway, Frankston, West Frankston. Location: Anderson and Henderson counties, East Texas, in the Tyler basin (salt domes) geologic province.

2. Discovery well: Cities Service Petroleum Co. 1-E White opened the Frankston field in Henderson County on March 30, 1955, with an IP of 218 bbl. oil per day flowing.

3. Trend of development: The pattern of existing fields is on a northwest-southeast-trending reef.

4. Number of producing wells: 10; Fairway 5, West Fairway 2, West Frankston 2, and Frankston 1.

5. Spacing pattern: 80 acres.

6. Proved acreage: over 5,000 acres, estimated.

7. Principal operators in area: Fairway Operating Co., Cities Service Petroleum Co., Sun Oil Co., Claude B. Hamill, Frank and George Frankel, and Jack Frost.

8. Present allowable: 220 bbl. per day with maximum of 1,650 cu. ft. of gas per bbl. produced.

Drilling Operations

9. Number of active drilling rigs: eight drilling, five locations.

10. Casing program: 13⅜-in. or 8⅝-in. surface casing set at least 2,000 ft., or 50 ft. into Midway shale, cemented to surface. Some 9⅝-in. to 2,200 ft. set with 733 sacks cement. Oil string is 7-in., 5½-in., or 4½-in. set to total depth.

11. Average drilling time: 35-40 days.

12. Types of drilling fluid: Mostly gel mud.

13. Completion method: Perforate casing.

14. Types, sizes, and total number of bits: 8¾ and 7⅞-in. rock bits; total of 25.

15. Special drilling problems: None reported.

Geology

16. Producing formation: Lower Cretaceous-James lime reef.

17. Reservoir characteristics: Type drive: gas in solution and water drive. Gas-oil ratio: low, 603 to 1, high 1,450 to 1. Oil-water contact: −9,550 to −9,575. Gas-water contact: nil.

18. Geological markers: In the discovery well of West Fairway, Fairway Operating Co. 1 Maymon, Austin chalk 4,513 ft., Woodbine 4,996 ft., Georgetown 6,256 ft., Paluxy 7,350 ft., Mooringsport 8,820 ft., Rodessa 9,470 ft., Top of James lime 9,868 ft.

19. Type trap: Both structure and stratigraphic. North-south-trending anticline along with a stratigraphic bioherm coquinal reef. Minor associated faulting is also present.

20. Core data: Only figure given—porosity is 12%, average.

21. Estimated recovery: 70 bbl. per acre-ft.

22. Pressures: IBHP 5,198 psi. Flowing TP 2,000 to 2,500 psi.

23. Tests and logging procedures: Induction log for resistivities. Neutron log for porosity determinations.

24. Pipeline outlets: None—now trucked by Scurlock Oil Co.

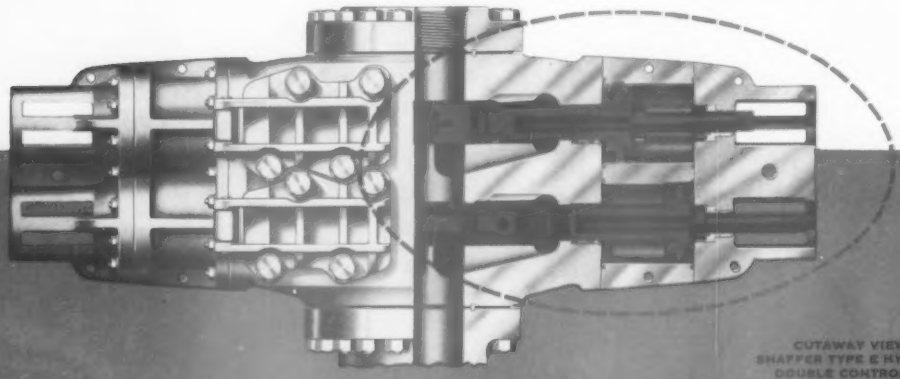
25. Exploration methods before discovery: Seismic, surface geology, and subsurface geology.

26. Average costs: Dry hole, $85,000. Flowing well, $125.000. Average total depth, 10,200 ft. Footage rate, $5. Day rate, $900 with drill pipe.

27. Gravity of crude: 48° API.

WHEN YOU BUY BLOWOUT PREVENTERS

GET SHAFFER "IN-LINE" POWER DRIVE ...IT'S POSITIVE!



CUTAWAY VIEW OF SHAFFER TYPE E HYDRAULIC DOUBLE CONTROL GATE SHOWING "IN-LINE" POWER DRIVES

WHAT IT IS... In Shaffer Blowout Preventers there is no complicated system of levers, rods and linkages connecting the rams with the hydraulic pistons that operate them.

Instead, each Shaffer ram and its operating piston is on a *single* stainless steel shaft that is fully enclosed within the body of the Preventer. When the piston moves the ram moves. There are no complex connections to jam, freeze or otherwise jeopardize positive action!

WHY IT'S BETTER... By eliminating levers that rock, connections that rotate and exposed linkages that move, you eliminate potential trouble spots that can interfere with quick, *positive* action when emergencies threaten.

- Shaffer Preventers give you the simplest, most trouble-free ram and piston design it is possible to build—with both the ram and its operating piston on a *single* shaft —and no complicated connections in between!
- Pressure seals are also reduced to a minimum because far fewer seals are required. And any time you eliminate seals you reduce maintenance, as well as possible problems, when high well pressures are encountered.
- Shaffer's design also means elimination of connections that require frequent oiling or greasing...elimination of exposed operating parts that can become corroded by chemical-laden muds or well-treating fluids...elimination of levers or yokes that can become jammed by loose boards, pieces of pipe, or other objects falling from the rig floor.

RESULT... When pressure emergencies threaten the safety of your well, Shaffer Blowout Preventers provide unequalled assurance of *positive* ram operation...and this is just one of the many "plus" advantages built into *every* Shaffer Blowout Preventer!*

THERE'S A SHAFFER BLOWOUT PREVENTER FOR YOUR PARTICULAR REQUIREMENT!

TYPE B and TYPE E Preventers are the units selected for most drilling applications. Type B has *non-rising* Locking Shafts for maximum compactness...Type E has *rising* Locking Shafts for quick ram indication.

TYPE XHP Preventers are ideal where extra-high well pressures are a problem. Each XHP unit is individually tested to 15,000 PSI *Working* Pressure in 7 1/16" Bore Size...to 10,000 PSI *Working* Pressure in 9" and 11" Bore Sizes.

TYPE LWS Preventers combine lightweight with adequate pressure rating for a wide range of applications. LWS units weigh approximately *half* as much as other Preventers of comparable size.

The above Preventers (except Type XHP) are available in choice of *Double* units *(two* Preventers unitized into one compact body for maximum space-saving)—or *Single* units.

See your nearest Shaffer representative for complete details. Or write direct!

*OTHER SALIENT SHAFFER ADVANTAGES...

- "Swing-Open" Doors for Quick Ram Changes!
- Space-Saving Compactness!
- Self-Cleaning Ram Compartments!
- Completely Enclosed Construction!
- "Floating" Ram Design!

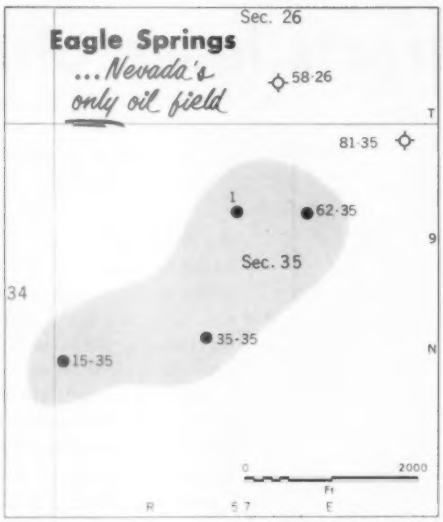
...and still others your Shaffer representative will gladly explain to you!

38 YEARS OF OIL TOOL LEADERSHIP

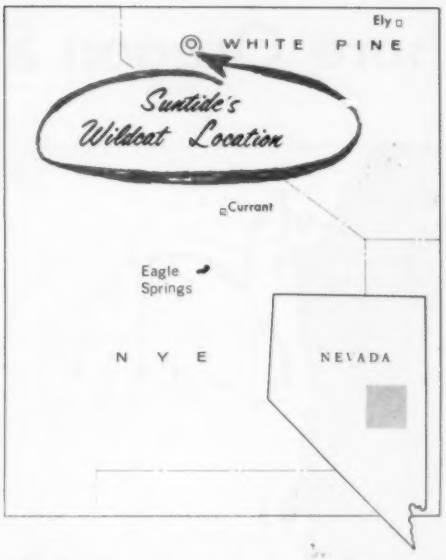
SHAFFER

HIGH PRESSURE DRILLING AND CONTROL EQUIPMENT • FISHING TOOLS THAT EXCEL

CALIFORNIA SERVICE SHOPS: Santa Fe Springs, Santa Maria, Ventura, Avenal, Bakersfield and Taft
HOUSTON, TEXAS, 6006 Navigation Blvd. • ODESSA, TEXAS, 1923 West Second Street
OKLAHOMA CITY, OKLAHOMA, Shaffer Tool Works, 6201 South Shields Boulevard
FARMINGTON, NEW MEXICO, Shaffer Tool Works, Post Office Box 546
CASPER, WYOMING, Shaffer Tool Works, Post Office Box 1788
HOUMA, LOUISIANA, Shaffer Tool Works, Post Office Box 827
EXPORT SALES OFFICE, Shaffer Tool Works, 500 Fifth Avenue, New York, N.Y., U.S.A.
IN CANADA: Shaffer Western Hemisphere, Inc., 5823 103A Street, Edmonton, Alberta.



HERE'S the state of things at Eagle Springs, Nevada's only oil field . . .



AND HERE'S the scene of a new Nevada wildcat . . . Suntide Petroleum Co. 1 Nevada Federal.

"Guts, geophysics, and gingerbread . . ."

Recipe for success in Railroad Valley

BY FRANK J. GARDNER

ON FEBRUARY 8, 1954, this column closed with the prediction that "...Nevada may well be the twenty-ninth state to produce oil."

In July of that year, Shell Oil Co. brought in its memorable discovery, the Eagle Springs Unit No. 1, for 373 bbl., in Nye County, Nevada. Production was from Tertiary tuffs at 6,737 ft., after the hole had been carried to intrusives at 10,356 ft.

A short-lived bonanza . . . It was by far the most exciting exploratory event of the year. Every available land man was packed off to Nevada by companies who'd been caught asleep at the switch. Life magazine made much of the "boom." Nevada was the new El Dorado.

No boom ever fizzled so fast. Disappointment at a few wildcats, complete lack of subsurface dope, and confusion over the discovery well itself all contributed to the p-f-f-t. Even today, five wells and 7 years later, Shell isn't sure of what it's got. Drilling so far has turned up three different fault blocks, but information on the source of the oil is sketchy.

Three more wells were drilled in the immediate area by Shell, following the first hit; two were producers and one a dry hole. Then the campaign languished. Ironically, the best well in the field was finished only 3 months ago, when the 62-35 Eagle Springs unit, east offset to the original discovery, made 400 bbl. per day. Following that, Shell sank the 81-35 farther to the east, and racked up a 7,805-ft. duster (see map). The company has no plans for new wells at this time, but when the drilling program is resumed, all signs point to the south as the most logical direction. A rework is planned at one of the four oil wells. Currently, the heavy-oil field is shut in, but production is scheduled to resume soon.

Now, a newcomer to the scene—evidently encouraged by the showings of the four Shell producers, a new operator makes its Nevada debut. Suntide Petroleum Co., a subsidiary of Sunray Mid-Continent Oil Co., has announced that it will drill a 5,000-ft. wildcat, the 1 Nevada Federal, in Section 5-15n-57e, White Pine County. Location lies about 40 miles north of Shell's Eagle Springs operations, in the northern end of Railroad Valley. Another interesting development is the target of the bit here—the Mississippian.

Accents a need for drilling . . . Suntide's well will be watched with more than passing interest. About the only things the wildcatter can rely on in this part of the country are surface geology and seismic surveys. Legitimate Nevada wildcats are scarce, and subsurface control is nil. Yet, there is confirmed "oil country" nestled in Railroad Valley on the western flank of one of the biggest basins in America—the Great basin of Utah, Nevada, and Idaho. Here, as in the Pacific Northwest, is great oil potential unrealized for lack of effort. The recipe for success calls for guts, geophysics, and gingerbread—lots of each. Obviously, Suntide has all the ingredients.

Offshore Oregon attracts lease offer

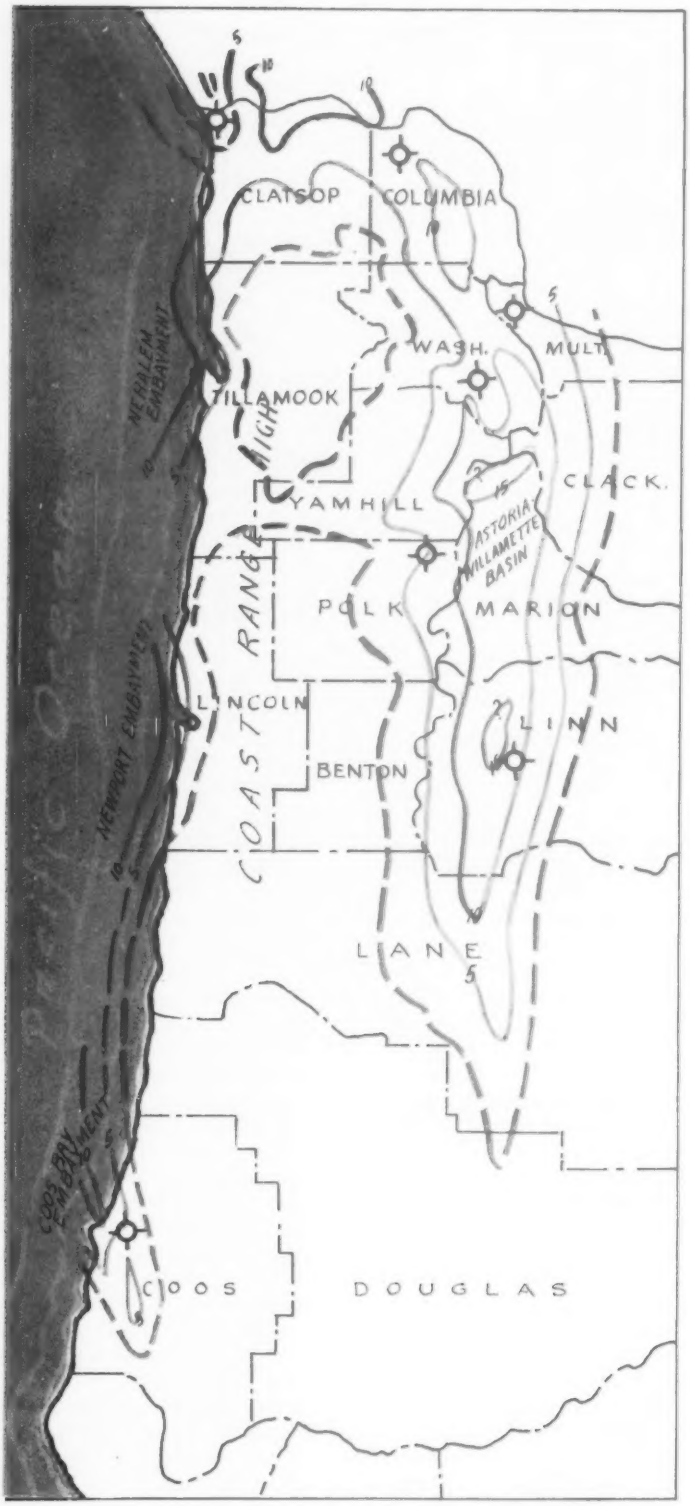
BY R. J. DEACON
Portland, Ore.

A RECENT application for a blanket lease on Oregon's entire offshore submerged lands by Shell Oil Co., focused nation-wide attention on the state's offshore oil and gas possibilities.

The proposed 10-year lease involves 541,000 acres of coastal submerged lands and 59,000 acres of submerged land in the bed of the Columbia River. Shell offered to pay $150,000 annual rental (25c per acre), drill a 7,000-ft. test in two years, and spend $150,000 per year for exploration after the second year. The company reserved the right to select and drop land at its discretion.

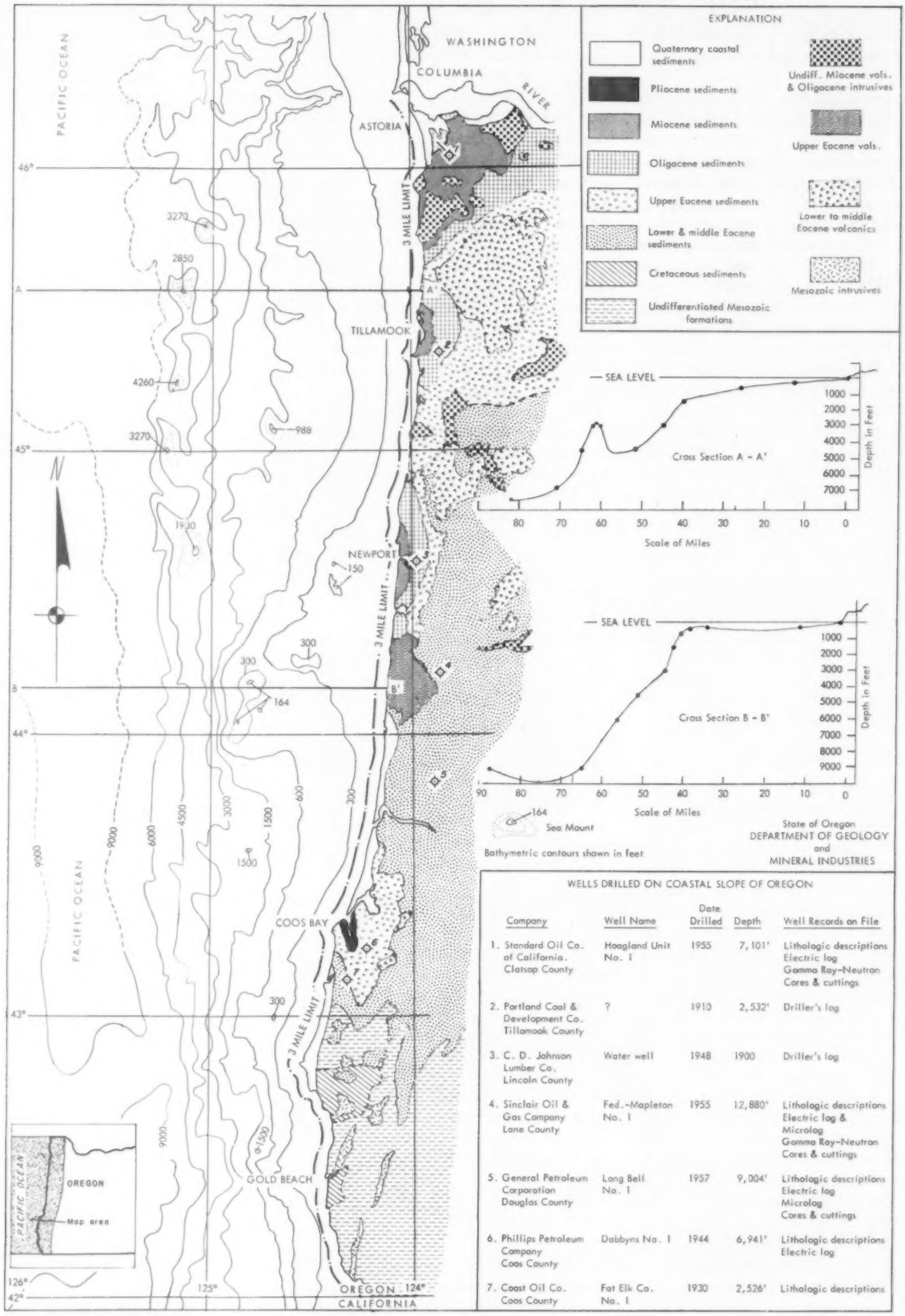
In response to Shell's application, Oregon's attorney general, Robert Y. Thornton, ruled at a meeting of the state land board that the board does not have the authority to lease submerged land of the state under existing statutes. Governor Mark O. Hatfield has asked that appropriate legislation be drafted for the present session of legislature, setting up conditions under which offshore lands could be leased.

The Shell move came as a surprise to West Coast operators. Geologists who have worked along Oregon's coasts have long regarded the offshore extension of onshore basins as being much more attractive than upland areas for oil and gas exploration. This is chiefly because only a small portion of the



OREGON'S OFFSHORE embayments have suddenly hit the exploration pages. Isopachs are on sedimentary section—upper Eocene through Pliocene. Interval is 5,000 ft. Dry holes on map are: Linn County, Linn 1 Barr, TD 4,529 ft.; Polk County, Reserve 1, TD 5,549 ft.; Washington County, Texaco 1 Cooper, TD 9,263 ft.; Multnomah County, Richfield 1 Barber; Columbia County, Texaco 1, TD 8,501 ft.; Clatsop County, CalStan 1 Hoagland, TD 7,101 ft.; Coos County, Phillips 1, TD 6,941 ft. Fig. 1.

SUBMARINE TOPOGRAPHY AND COASTAL GEOLOGY OF OREGON



WELLS DRILLED ON COASTAL SLOPE OF OREGON

	Company	Well Name	Date Drilled	Depth	Well Records on File
1.	Standard Oil Co. of California. Clatsop County	Hoagland Unit No. 1	1955	7,101'	Lithologic descriptions Electric log Gamma Ray-Neutron Cores & cuttings
2.	Portland Coal & Development Co. Tillamook County	?	1910	2,532'	Driller's log
3.	C. D. Johnson Lumber Co. Lincoln County	Water well	1948	1900	Driller's log
4.	Sinclair Oil & Gas Company Lane County	Fed.-Mapleton No. 1	1955	12,880'	Lithologic descriptions Electric log & Microlog Gamma Ray-Neutron Cores & cuttings
5.	General Petroleum Corporation Douglas County	Long Bell No. 1	1957	9,004'	Lithologic descriptions Electric log Microlog Cores & cuttings
6.	Phillips Petroleum Company Coos County	Dabbyns No. 1	1944	6,941'	Lithologic descriptions Electric log
7.	Coast Oil Co. Coos County	Fat Elk Co. No. 1	1930	2,526'	Lithologic descriptions

GEOLOGIC MAP of coastal slope of Oregon shows distribution of Tertiary and older units along the coast. **Fig. 2.**

basin area is exposed onshore and because few large structures have been mapped in upland areas.

Past exploration. Oregon's coastal belt has been largely neglected in past exploration. Only two major companies have drilled here. Standard Oil Co. of California, Western Operations, Inc., drilled south of Astoria in Clatsop County in 1955. The well penetrated the entire Tertiary marine section and bottomed in Middle Eocene basement volcanics. No significant shows or important sands were developed. Phillips Petroleum Corp. drilled in the Coos Bay basin in 1944. The well found Middle Eocene basement volcanics at 2,325 ft. much higher than expected, and no significant shows or sands were developed. Several shallow wells have been drilled in the Coos Bay basin but failed to develop significant information. No wells have been drilled in the Newport embayment and only one shallow well in the Nehalem embayment. Since the Sinclair 1 Federal Mapleton, 12-16s-10w. TD 12,880 and General Petroleum Corp. 1 Long - Bell 27-20s-10w, TD 9,004 ft., tested a pre-Upper Eocene section, they are not considered in this report.

Stratigraphy

The Oregon coast range forms a major high between flanking structural basins. Rough isopachs (interval 5,000 ft) have been drawn to show post-Middle Eocene basin outlines and to suggest possible maximum thickness for these basins. Wells in this region that have penetrated the sedimentary sequence from Miocene down through Upper Eocene are extremely sparse. These few wells and suggested basin development in published cross-sections were used to construct the map. It is important to note that in most areas edge lines of structural basins closely follow outlines of the original sedimentary basin. The coast range therefore is thought to have been a positive area during the period from uppermost Eocene through Miocene.

The geologic map of the coastal slope (Fig. 2) shows the distribution of Tertiary and older units along the coast. The map also shows by bathymetric contours the submarine topography of the ocean floor. It is significant to note that a considerable shelf area with water depths of less than 300 ft. is present. Within the 3-mile limit of state lands, much of the coastal area has water depths of less than 150 ft.

Coos Bay embayment. Upper Eocene through Pliocene onshore Marine and nonmarine sediments in the Coos Bay embayment have an aggregate thickness of over 9,400 feet. No Miocene sediments are present in the onshore area of this basin. These sediments are predominantly sand with lesser amounts of shales and intercalated coal. They overlie a surface which includes middle and lower Eocene marine sediments, volcanics and pre-Tertiary metamorphics.

Numerous gas shows have been developed in several shallow wells, some of which showed significant amounts of hydrocarbon fractions higher than methane. Small bituminous dikes have also been identified (Hodge, 1927). One well, drilled by the Coast Oil Co., 11-28s-13w, reported an estimated 750 M.c.f.d. of gas production potential from sands at 1,650 ft.

The basin includes a number of fair-sized anticlines with 1,000 to 1,500 acres within closure and several attractive areas of fault closure. The lenticular development of sands and unconformities also provides potential stratigraphic plays. The one deep Phillips test has by no means evaluated this basin onshore, and its offshore significance is considered negligible.

Newport embayment. Sediments within the Newport embayment are entirely marine and have an aggregate thickness of over 10,000 ft. It is probable that within a mile offshore the total section may thicken to near 15,000 ft. The basin includes a complete section from Upper Eocene through Middle Miocene. It comprises sands and shales in the Eocene and Oligocene, and principally shales with overlying sands in the Miocene. Middle Miocene basalt flows cap the marine section in places.

The offshore extension of the Newport embayment is one of the more attractive areas for oil and gas exploration along the coast because of the presence of the Nye shale. A strong petroleum odor has been noted in fresh samples in the lower Miocene shale from several areas. Live oil has also been found in the vesicles in overlying basalt at Yaquina Head.

Only one shallow well has been drilled in this basin and no data are available on it. The lack of attractive onshore structures has been a major reason for the absence of drilling. It is not unlikely that offshore structures have been developed in the basin and stratigraphic possibilities are present in both the upland and offshore areas.

Nehalem embayment. An aggregate thickness of about 8,500 ft. of sediments, the bulk of which are marine, is present within the onshore area of the Nehalem embayment. The sediments range from Upper Eocene through Middle Miocene and include basal sands and conglomerates in the Eocene, sands and shales in the Oligocene, and chiefly sands and some basalt flows in the Miocene.

The lone well drilled in this basin reported both oil and gas shows, which are unconfirmed. A water well drilled in 1959 in the northern part of the basin by Jannsen Drilling Co. penetrated a 1-foot Oligocene sand which gave off a strong petroleum odor and had good uniform fluorescence.

While attractive onshore structures are not known in this basin, it is probable that this too is due primarily to lack of surface mapping. Structures are probably present in this basin and are undoubtedly present offshore.

Willamette - Astoria basin. The Astoria-Willamette basin includes marine and nonmarine sediments which range in age from Eocene through Middle Miocene. It includes a minimum thickness of 5,000 ft. of Upper Eocene sands and shales, 3,000 ft. of Oligocene sands and shales and at least 3,000 ft. of Miocene sands and shales for an aggregate thickness of over 10,000 ft. As suggested by isopach, a total thickness of 15,000 ft. may be present in structural lows in the Willamette Valley.

Several wells drilled in this basin demonstrate that highly porous and

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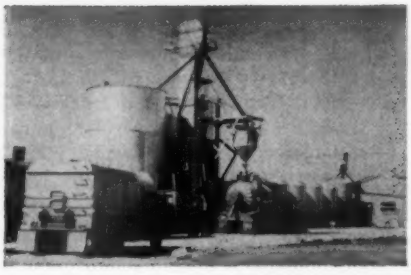

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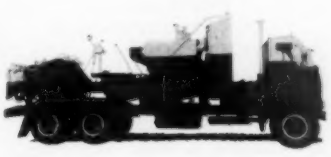

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permeable sands are present in subsurface sections. The Texaco Cooper Mtn., 25-1s-2w, Washington County flowed salt water from Eocene sands at a rate of 79 bbl. per hour. The Texaco Clark & Wilson, 19-6n-4w, Columbia County, flowed salt water at a rate of 68 bbl. per day from two Eocene sands. No significant shows of oil or gas were found in these wells.

The few wells drilled in the Willamette-Astoria basin have by no means evaluated its potential.

What's Ahead

The Oregon legislature now has in its hands the burden of responsibility for making a law to allow leasing of state-owned tidelands acceptable for rank wildcat exploration. It is anticipated that a bill to cover offshore leasing will get early attention by the current session of legislature.

The old axiom that one in the hand is better than two in the bush may not apply here but while current tempo of interest is high on Oregon offshore potential it behooves the state to move rapidly in developing an attractive exploration proposal.

Abandoned California well redrilled

A well abandoned as a dry hole 3 years ago has been completed as a fault-block discovery in Arbuckle gas field, Colusa County, California.

Occidental Petroleum Corp. has completed the 1-RD Arbuckle unit HH at a rate of 5 M.M.c.f.d. from a 38-ft. pay section at 4,584-4,622 ft. The discovery is ½ mile northeast of the Arbuckle discovery well, which was completed as a Cretaceous well in 1957. Flow from the 1-RD was through a ⅜-in. choke.

Occidental redrilled the well to 6,316 ft., but cemented the hole at 4,721 ft. after failing to recover a fish in the hole. The test is located in 2-13n-2w.

Arizona Record Book released

A book containing wells drilled in Arizona is now available from Arizona Well Records Co., 3550 North Central Avenue, Phoenix. This is a collection of 113 driller's logs or sample logs which, through the years, have been filed with the State Land Department and are presently on file with the State Oil and Gas Commission in Phoenix. These well logs are part of the public record.

Few wells have been drilled in Arizona. For vast areas of the state, these logs represent the only subsurface control available. The logs are in alphabetical order by counties and then by operators. It is hoped that these logs will supply one more contour point to the general knowledge. In an area so unexplored as Arizona, any available information should be studied. It is hoped that this publication will stimulate more interest and activity in Arizona.

Two gas discoveries made in California

TWO NEW FIELDS have been added to the growing list of gas discoveries in California's Sacramento Valley.

The latest discoveries both were made in Sutter County, one by Gulf Oil Corp.; the other by Occidental Petroleum Corp. Both finds are in the Upper Cretaceous F zone, the primary target of most of the current Sacramento wells.

Gulf's 1 David S. Lewis in 23-13n-1e is 2 miles southeast of Kirk gas field, a Gulf find of 1960. The discovery well flowed at the rate of 2,350 M.c.f.d. through a ¼-in. choke from perforations at 8,246-56 ft. Gulf took the well to a total depth of 9,200 ft., but failed to come up with commercial production on a drill-stem test at 9,029-58 ft.

The Occidental discovery, 1 Standard-Browning, is in the northern part of the county in 19-16n-1e. The discovery is in the West Butte area and is 2¼ miles northeast of nearest production in Butte Slough field, a one-well gas field.

The 1 Standard-Browning was completed at a rate of 2,271 M.c.f.d. from four perforated intervals between 5,688-5,849 ft. in the Upper Cretaceous F zone sands. The flow was through a 15/64-in. choke. The four sections totaled 62 ft. of pay with two 21-ft. sections included.

The Browning wildcat was drilled on a 50-50 working interest with Standard Oil Co. of California. Occidental and Socal plan to develop the 17,000-acre block jointly on a 160-acre spacing pattern.

An offset, 2 Standard-Browning, is drilling ahead below 2,500 ft. toward a target depth of 7,500 ft. The discovery was taken to 7,664 ft.

Other tests. Occidental has two other wildcats drilling in the Sacramento Valley.

The K-2 Zumwalt is drilling ahead below 6,200 ft. in 12-13n-2e in Colusa County about 6 miles east of the Lewis discovery. The test is scheduled to go to 8,500 ft. to the F zone.

In the northern part of the valley, Occidental is below 1,716 ft. on the 1 Wico-Walker Creek unit in 30-22n-3w, Glenn County. This wildcat is on a 12,000-acre farmout from Wico Oil Co. Occidental can earn a 100% interest in half the acreage by coming up with a discovery. The 1 Wico-Walker is expected to tap both the F and Kione zones before reaching a total depth of 6,000 ft.

Second producing zone added to Kansas field

A second pay is reported in a newly opened field in Barton County, Kansas. Colorado Oil & Gas Corp. 2 Russell "B," SW NW SE 29-18s-14w, pumped 102 bbl. of oil per day plus 2% water from Conglomerate at 3,497-3,501 ft.

The discovery well of the field, 1 Russell "B," NE SE SW 29-18s-14w, 6 miles northwest of Great Bend, was completed for 91 bbl. of oil daily last month from Lansing-Kansas City Pennsylvanian perforations at 3,388-92 ft. Name of the new field is Southeast Erna.

Barber County. Crescent Petroleum Corp. completed an excellent flowing oil well in West Palmer field. The 2 Mills flowed at the rate of 150 bbl. of oil and 500 M.c.f.d. through 18/64-in. choke from perforations in the Mississippi formation at 4,521-36 ft. The 1 Mills had previously been completed as a gasser.

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New pay reported for Illinois' Clay County

A 500-bbl. well is reported in Clay County, 2 miles west of Sailor Springs, Ill. The discovery is Sylvester et al. 1 Schnepper-Hastings unit, NW SE NW 22-4n-7e.

Flow was 500 bbl. per day from McClosky at 2,964-72 ft. Two locations east, the same operators are preparing to test the O'Hara at 2,941-47 ft. at 1 Conley unit in NW SW NE 22-4n-7e. This will be a new pay for the area.

One new oil pool for Illinois in March

One new oil pool, Dollville in Shelby County, was discovered in Illinois in March.

There were three extensions to pools, as follows: one each to Clay City Consolidated and Sailor Springs Consolidated pools in Jasper County and Springfield East pool in Sangamon County.

A total of 64 new oil and gas tests was completed in the 4-week period. The new tests resulted in 26 oil wells, a success ratio of 40%. In addition, five wells that had previously been completed as dry holes were worked over or deepened and recompleted as oil wells. No wells were completed for gas production. Muddy roads and fields has kept drilling to a minimum.

One of the present areas of very successful drilling in Illinois is 2-3 miles southeast of Flora in 33-3n-7e, and Sections 4 and 9-2n-7e, Clay County. So far this year 10 oil wells have been completed. Initial production figures ranged from 35 to 247 bbl. of oil a day and averaged 86 bbl. a day. Production is from Aux Vases sandstone and McClosky limestone.

Two to three miles west of Crossville, in Sections 20 and 29-4s-10e, White County, 11 oil wells were completed during the first quarter of this year. Initial production figures ranged from 42 to 700 bbl. of oil a day and averaged 450 bbl. O'Hara limestone is the producing zone.

Only one of the tests reported in March was drilled deeper than 4,000 ft. The 1 Campbell "H" well in 33-2n-8e, Wayne County, was drilled by Collins Bros. to a total

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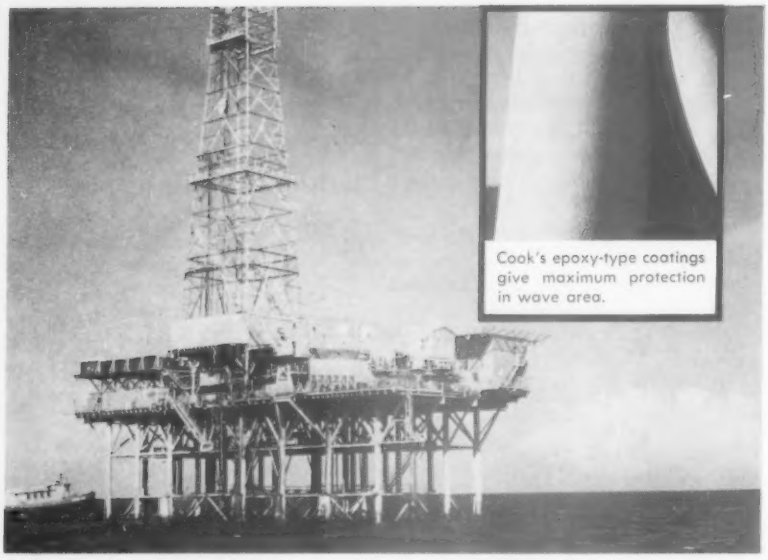

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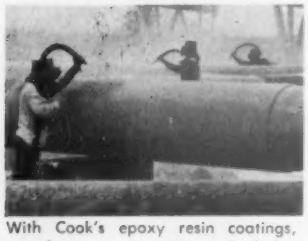

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depth of 4,904 ft. and tested a show of oil in the Dutch Creek sandstone, topped at 4,878 ft. The well was completed as a dry hole and plugged.

Estimated production for Illinois for March is 6,504,000 bbl.

East Kentucky well drilling ahead

In eastern Kentucky's Elliott County, United Fuel Gas Co. deep wildcat test 1 Ada Pennington is drilling below 3,650 ft. with no formation tops reported. Well is located in 21-T-77, 1,750 ft. from east line and 5,325 ft. from south line. Elevation is recorded at 918 ft.

Wildcat test shuts down in Central Kentucky

In Central Kentucky, a rank wildcat test in Garrard County is shut down for orders at a total depth of 895 ft. The well is Pat Vogler 1 W. C. Blakeman 14-P-59, 9,450 ft. from west line and 12,450 ft. from north line. From an elevation of 920 ft., the Ordovician Pencil Cave formation was reported at 38 ft. Garrard County has never had any commercial production and relatively few tests. Geologically the county is located high upon the eastern flank of the Cincinnati arch and practically all tests start in the Ordovician. Operators therefore have only Ordovician and Cambrian possibilities to shoot for.

Strikes 7 miles apart in Karnes County, Texas

Distance between two Edwards lime oil discoveries in Texas' Karnes County is 7 miles. Amerada Petroleum Corp. 1 Aloys Pawelek, southwesternmost well in Person field, 6 miles north of Panna Maria, flowed 296 bbl. of oil per day, plus 4% salt water, flowing through 14/64-in. choke, from upper Edwards lime at 10,868-86 and 10,902-16 ft.

This well is 7 miles southwest of H. D. Bruns 1 Wiatrek, northeasternmost well on the trend. It moves field limits almost ½ mile southwest of Shell Oil Co. 1 Pawelek, and to within 4 miles of Standard Oil Co. of Texas' Edwards lime production at Panna Maria.

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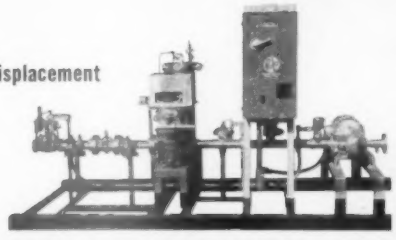

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Manila Village field moves into Plaquemines Parish, Louisiana

Production at Manila Village field in Jefferson Parish, South Louisiana, has moved 1½ miles into Plaquemines Parish. The California Co. completed 1 Louisiana State 3660-unit 1 in 31-18s-25e flowing 163 bbl. of 29.9°-gravity oil per day on 7/64-in. choke from perforations at 10,291-10,302 ft.

South Singer confirmed. This Beauregard Parish field was confirmed at F. E. Jameson 1 Heyden-Newport Industries, Inc., in 26-5s-11w. The well flowed 135 bbl. per day from perforations at 8,001-5 ft.

Riceville. The California Co. 2 Vermilion Parish School Board, new gasser in Riceville field, Vermilion Parish, flowed 7,200 M.c.f.d. and 356 bbl. of condensate from perforations at 15,036-53 and 15,062-66 ft. through 17/64-in. choke. Location is in 16-11s-2w, 1,600 ft. northwest of a gasser at 1 School Board which extended the field.

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Texas' Frankston well tops James pay

A thick James lime pay zone is reported at Birdsong-Cabriel Oil Co. 1 W. F. Westbrook, John Raschall Survey, A-662, 1½ miles west of West Frankston field in southern Henderson County, East Texas.

The operator is cleaning and testing James lime perforations at 9,935-40 ft. in the lower part of 112 ft. of pay cored and logged at the wildcat. Hole is bottomed at 10,025 ft. Casing is set to that point. Top of James is at 9,812 ft. This well is about 100 ft. high structurally to the top of the James at nearest well in West Frankston field. Location is 1¾ miles north of West Fairway field James production in Anderson County and 1¼ miles northeast of Poyner.

West Fairway field. Fairway Operating Co. gaged 1 Eva Hurt in the Alfred Benge Survey, A-106. Flow was 270 bbl. of 50°-gravity oil per day through 12/64-in. choke. Perforations are at 9,914-24 ft.

Repotential is reported at Fairway 1 A. J. Wilkerson in the Jose Cherino Survey, A-168, Fairway field, Anderson County. The well flowed 297 bbl. of 40.8°-gravity oil per day through 11/64-in. choke from perforations at 9,436-52 ft. in James. Well originally made 150 bbl. per day from this zone.

Texas gas well is shut in

Atlantic Refining Co.'s 1 J. C. Kelly, multipay gas discovery in western Pecos County, 31 miles west of Fort Stockton, was shut in again after flowing gas from perforations in the upper Montoya Ordovician, lower Montoya, Silurian, and Devonian sections.

From perforations at 15,831-15,982 ft. in Devonian, 16,061-16,170 ft. in Silurian, 16,580-16,680 ft. in the lower Montoya, and 16,228-16,402 ft. in the upper Montoya the well flowed at the daily rate of 32,600 M.c.f.d., through 1-in. choke. Location is in Section 8, Block 51, T-10, T&P Survey. There is no nearby production.

Nueces County, Texas, gains big gas discovery

A Nueces County wildcat, 1 mile southeast of three-well East Stratton field in the same county, flowed 31,500 M.c.f.d. from middle Pflueger sand through perforations at 7,251-60 ft. The big well is Coastal States 1 Treybig, Section 188, F. Z. Bishop Subdivision, 4 miles northwest of Bishop.

Offshore. Shell Oil Co. will drill an 8,000-ft. wildcat in the Gulf of Mexico off Galveston on their 5,760-acre block, 25 miles southeast of Freeport. The well will be 1 Federal Block 328, OCS Tract 0718. Location is 50 miles southwest of production at GAB 189 field.

Dual pay for Oklahoma's Kingfisher

In Oklahoma, Sunray finaled the 1 Marshall "A," C NE SE 28-19n-6w, Kingfisher County, as a dual oiler in Southeast Hennessey pool.

Final tests gaged 172 bbl. of oil a day through 18/64-in. choke from perforations opposite the Manning at 6,686-6,716 ft. Tubing pressure was 250 lb. Deeper in the hole the well flowed 102 bbl. of oil a day through 20/64-in. choke from Meramec open hole at 6,901-79 ft. Tubing pressure registered 200 lb. psi. Total depth was 6,979 ft.

Kingfisher paces Sooner drilling

OKLAHOMA drilling remains at a high pitch, paced by Kingfisher County activity.

Champlin Oil & Refining Co. 1 Sturgeon, C SW SW 4-18n-5w, opened West Coyote field in Kingfisher County flowing 111 bbl. of oil per day from open hole in the Meramec Mississippian at 6,326-6,420 ft. The 1 Williams, NW SW SE 27-18n-5w, tested oil in the Oswego and Meramec. Several offset and extension wells are already under way here. Champlin reworked 1 O'Hern in C NE NW 16-18n-5w, an old Harper Oil Co. well. This well at Northwest Columbia flowed 367 bbl. of oil per day through chokes from Oswego at 6,070-88 ft. The gap between Southeast Hennessey and North Dover field is down to ½ mile. Southeast Hennessey shows indications of linking with North Dover in Sections 5, 6, and 7 of 18n-6w.

Northern Oklahoma. In Alfalfa County, Sinclair Oil & Gas Co. found gas-condensate in North Vining field at 1 Guffy, C SW NE 16-27n-9w.

A test at 5,163-5,215 ft. got 1,790 M.c.f.d., increasing to 3,310 M.c.f.d. after 3 hours.

Northwest. In Beaver County's Mocane district, Shell Oil Co. 1 Cole, C SE NE 3-3n-24eCM, flowed 3,286 M.c.f.d. through ½-in. choke from lower Morrow Pennsylvanian perforations at 7,102-12 and 7,118-26 ft. Humble Oil & Refining Co. completed 3 Corbin Lehmann in C NE NE 31-1n-20eCM, East Cambrick field, flowing 238 bbl. of oil in 12 hours through 3/64-in. choke from perforations in the upper Morrow at 7,215-18 and 7,236-42 ft.

In Ellis County, Pan American 1 Purdum, C NE SW 3-22n-25w, wildcat discovery east of North Linscott field, flowed 3,400 M.c.f.d.

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from perforations in the Morrow at 8,668-70 ft.

In Garfield County, Marion Oil Co. 1 Walta, C SW NE 36-20n-5w, new pool north of East Hennessey field, flowed 16,050 M.c.f.d. from perforations at 6,314-22 ft. in the Manning Mississippian. Distillate flow was 12 bbl. per million. The Meramec zone was good for 5,500 M.c.f.d. and 220 bbl. condensate in 24 hours from open hole at 6,490-6,550 ft.

Sinclair Oil & Gas Co. got production in three pays at 3 Rosa Lee Kuhn in C SW SE 6-28n-22w, North Buffalo field. Flow from Kansas City lime at 5,228-30 ft. was 156 bbl. of oil in 16 hours through 24/64-in. choke and 2,196 M.c.f.d. From Lansing at 4,610-18 ft. flow was 245 bbl. in 7 hours through 20/64-in. choke. From Arbuckle at 7,626-51 ft. it swabbed 152 bbl. of oil in 24 hours.

In the Stockholm field area, Gulf Oil Corp. 1 Logan, C NE SW 6-26n-23w, flowed 1,100 M.c.f.d., from Tonkawa Pennsylvanian at 5,280 ft., 2,620 M.c.f.d. from Morrow at 6,540 ft., 4,677 M.c.f.d. from Chester Mississippian at 6,568 to 6,744 ft.

Shell Oil Co. confirmed a two-pay discovery in the Guymon sector at 1 Matter, C NE SW 14-5n-16eCM, Texas County. The well flowed 4 M.M.c.f.d. from upper Morrow sand at 6,102-36 ft. through 24/64-in. choke. The Keyes at 6,428-83 ft. got 2,300 M.c.f.d.

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Gravity-map service formed

U. E. Neese, Neese Exploration Co., announces the formation of an associate company, Gravity Map Service, in Houston. This new firm was brought about by the necessity for data trading in the exploration industry.

Through data-trading deals, Neese conceived the idea of accumulating released gravity data in a single library. The library is made available to all who wish to avail themselves of these data, either by trading or by outright purchase.

All trades and sales are arranged on a confidential basis. Interpretations are available at a slight additional cost.

Michigan well slated for test

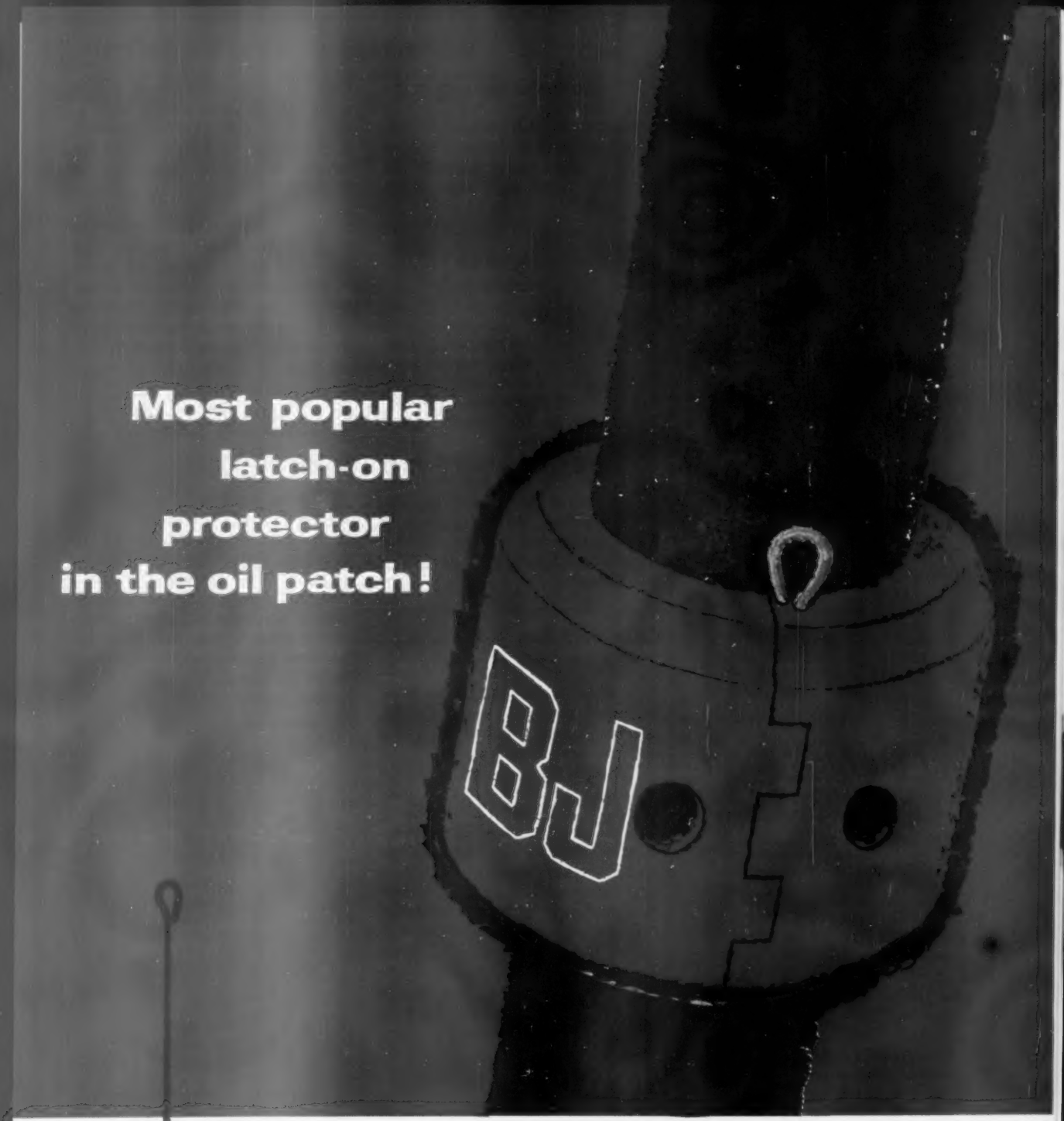
St. Clair County continued to develop new prospects with Leonard Oil, Inc. 1 Brown, NE NE SW 24-5n-15e, Columbus Township, showing 30 ft. of oil and gas-cut mud in the top of the Niagaran from 2,888-2,908 ft. Wildcat had Brown Niagaran at 2,892 and will be cored from 2,908-3,200 ft. before making a production test.

Leonard's prospect is located 5 miles northeast of Peters pool, and is the fifth new prospect for the general area in the past 6 months.

New pool opens in Nebraska

In Nebraska Sunray Mid-Continent Oil Co. has opened new production on the Cambridge arch.

The pool opener is 1 Nebraska State "B," C SE NW 36-3n-38w, Dundy County, located 3 miles northwest of Sunray's Pierce Lake



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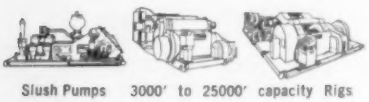

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field Pennsylvanian discovery in the same county.

Tests on the well pumped 47 bbl. of oil a day from Lansing-Kansas City perforations at 4,248-58 ft. and 4,296-4,304 ft. Total depth was 5,067 ft.

New producing area in southern Nebraska's Furnas County

Southern Nebraska's Furnas County is the state's newest producing area. Exeter Drilling Co. completed 1 Palmer in S NE SE 17-2n-25w as the county's first commercial producer.

The well pumped 131 bbl. of oil daily, cut 2% b.s. and w., from perforations at 3,391-94 ft. in Reagan Cambrian sand. Location is about 8 miles east of Pennsylvanian oil in Silver Creek field, Red Willow County.

Ohio field has 1-mile stepout success

In Ohio, a mile stepout north of Millbrook pool in Plain Township, Wayne County, resulted in a 90-bbl. producer after fracture.

The operator, Edward J. Kubat reported the Clinton sand was found at 3,239-65 ft. in the 1 Vance Sauger, Section 25e.

Atlas Exploration Corp. moved across the township line for a second followup success to the new pool discovery in Smith Township, Mahoning County. A 3,028 M.c.f.d. gasser was completed on 1 Irvin Bucks, Section 25, Deerfield Township, Portage County. The Clinton sand was found at 4,900-53 ft. and gaged 200 M.c.f.d. natural.

New Mexico's Eddy taps new Abo pay

New Abo reef production is reported at a wildcat in Eddy County, Southeast New Mexico. Discovery is Nash, Windfohr & Brosn 22-B Jackson, 28 miles east of Artesia in 24-17s-30e.

The new flowing strike made 85 bbl. of 44.4° - gravity oil daily through 10/64-in. choke. Perforations were at 6,955-71 and 6,980-90 ft. It lies 1½ miles southwest of Abo production at Sinclair Oil & Gas Co. 65-B Turner well and 3 miles east of Texas Pacific Coal & Oil Co. 1 USA-Wooley, another Abo discovery of late. It lies in the middle of shallow production in Premier field.

Lea County. Cities Service Oil Co. 1-BJ State, west offset to a new Abo reef find 10 miles southwest of Lovington in 36-17s-35e, flowed 241 bbl. per day through 24/64-in. choke, confirming the new pool. Production is from Abo at 8,914-44 ft.

Second big gas strike for B. C.

THE Northern Foothills Agreement Group, a combination of Texaco Exploration Co., Mobil Oil of Canada, Ltd., British American Oil Co., Ltd., and Shell Oil Co. of Canada, Ltd., for development and exploration of northeastern British Columbia properties, has indicated that province's second major natural-gas strike for this drilling season.

The well is almost midway be-

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tween Western Natural Gas Co.'s major reserves in the Petitot River and Kotcho Lake fields and while not fully tested as yet drill-stem tests in the Slave Point-Middle Devonian structure indicated that another high-pressure reservoir had been tapped. Due to the very high rate of gas encountered during the evaluation test it was impossible to get a reading on the flow. Estimates place it far in excess of 10 M.M.c.f.d., however.

The drill-stem test was conducted over a 139-ft. interval immediately below 6,761 ft. but only covered the top 30 ft. of the Slave Point of which there is a 180-ft. gross pay sector. After returning water cushion to surface gas immediately started blowing. Pressures were so high that the flow line was impossible to "peg" down and surface connections were washed out. After the tool was shut in gas was bled off and even then rated 1,240 M.c.f.d. A pipe recovery of 60 ft. of fresh water (part of the cushion) and 330 ft. of gas-cut mud was made.

Location. This strike, Texaco-NFA-TSEA b-68-K, was drilled on Quarter Unit b, Unit 68, Block K, National Topographic Series Index Map 94-P-5. That places it in the Tsea River district 50 miles northeast of Fort Nelson, 20 miles south of Slave Point gas wells in Petitot River field, 30 miles northwest of the past drilling season's only other major gas strike in northeast British Columbia - Western Natural's b-30-F Kathy venture which is itself 5 miles northwest of Kotcho Lake field development — and 15 miles northeast of Pan American Petroleum Corp.'s indicated Slave Point gas success in the Komie Creek district.

Following the drill-stem test hole was carried to total depth 7,110 ft. String of protective casing had been placed in the hole before the Slave Point porosity was entered and following completion of drilling production casing and tubing was placed in the hole. Production tests, meanwhile, will have to wait until next fall, after freezeup as movement of equipment in the area as of now is a virtual impossibility and far too costly.

Spring-like conditions have forced operations in all of western Canada to a standstill and movement of rigs from the north country is almost complete. That can be clarified no better than by taking a look at the active rig total in western Canada at present. Whereas there were 224 rotary units at work 1 month ago there is now only 135 actually making hole. The trend in northeastern British Columbia is no different. In that region 30 units were working the first of March but at present there are 13 and some of those have been released since the date of the survey at April 1.

For explorationists:

A long, hard look at gas finding

NEXT WEEK, the search for natural gas will be probed from many angles in the Journal's special annual report on exploration.

The 48-page report in the April 24 issue will be chock-full of information of vital importance. Here's a rundown:

√ For the first time, the Journal will present reservoir data and reserves for each of the world's 50 largest gas fields (1 trillion cubic feet or more), plus data on 75 smaller U. S. fields. No other publication has ever attempted such a project.

√ Can we look for gas in preference to oil? Seven experts give their views.

√ Natural-gas reserves, production, and demand from infancy to the present, plus outlook to 1980.

√ Where are we finding natural gas now? This will be answered in a series of articles on new drilling campaigns.

√ The Black Mesa is discussed as a typical unexplored gas province of the future.

Don't miss this important Journal report next week, April 24.

Ohio field map is available

A map of the oil and gas fields of Ohio, 1960, scale 1 in. to 6 miles, may be obtained from the Division of Geological Survey, Orton Hall, 155 South Oval Drive, Columbus 10, Ohio.

This map is a revision of the oil and gas-fields map of 1953. It shows by color the extent of all the known oil pools and gas pools in Ohio and also the areas used for underground storage of gas and liquid-petroleum products. A table at the bottom gives the names of the oil and gas fields, date of discovery, producing horizon, and depth to producing horizon. Also included is a generalized section of rocks of Ohio which gives the geologic names of the bedrock formations of Ohio plus the drillers' names for these same formations.

This map will be in great demand by all who are interested in the oil and gas industry of Ohio, property owners, drillers, dealers in drilling equipment, chambers of commerce, and geologists.

Triple completion reported at Montana's Pennel field

A triple pay producer from Lodgepole Mississippian, Silurian, and Ordovician is reported in Pennel field, Fallon County, Williston basin, Montana.

The well is Shell Oil Co. 24-23 Government-Warren, SE SW 23-8n-59e. It pumped 202 bbl. of 33.2°-gravity oil and 18 bbl. water daily from Lodgepole perforations at 7,994-96 ft., 170 bbl. of 32.2°-gravity oil and 77 bbl. water per day from Silurian perforations at 8,138-71 and Red River Ordovician at 8,653-55 and 8,793-95 ft.

Completions reported at Escrito field, New Mexico

Two Gallup oil wells were finaled in the Escrito area of Rio Arriba County, San Juan basin, northwestern New Mexico. Val R. Reese & Associates 4-22 Lybrook, NW SE 22-24n-7w, inside the field proper, flowed 247 bbl. of oil daily through 24/64-in. choke. Perforations were at 5,440-5,628 ft. The 1-10 Campos, 2½ miles south in NW SE 10-23n-7w, flowed 336 bbl. of oil

per day through 26/64-in. choke. Production is from perforations at 5,588-5,608 ft.

Hourly flow rate reported at Nebraska Penn well

Oil swabbed at the rate of 25 bbl. per hour at 1 Haag, C NW NW 19-2n-26w, Red Willow County, a Burch Drilling Co. new-pay discovery for Silver Creek field. Recovery is from perforations at 3,520-28 and 3,543-49 ft. in Cherokee sand, Lower Pennsylvanian.

Discovery wells

CALIFORNIA

Colusa County:

Occidental Petroleum Corp. 1-RD Arbuckle unit HH, SE SW SW 2-13n-2w. Completed flowing at rate of 5 M.M.c.f.d. through ⅜-in. choke from 4,584-4,622 ft. TD 6,316 ft. Fault block discovery in Arbuckle field.

Sutter County:

Gulf Oil Corp. 1 David S. Lewis center SE ¼ 23-13n-1e. Completed flowing at rate of 2,350 M.c.f.d. through ¼-in. choke with flowing pressure of 700 psi. from 8,246-56 ft. TD 9,200 ft. Pay is Upper Cretaceous F zone. Discovery well in Lewis field, 2 miles southeast of Kirk gas field.

Buttes Gas & Oil Co. 16 Buttes Community NW SE NE 4-15n-1e. Completed flowing 8 M.M.c.f.d. through ½-in. choke from Upper Cretaceous Forbes zone at 4,360-4,442 ft. TD 6,500 ft. New pool discovery in Marysville Buttes field.

Occidental Petroleum Corp. and Standard Oil Co. of California 1 Standard-Browning, center of 19-16n-1e. Completed flowing at rate of 2,271 M.c.f.d. from four perforated intervals between 5,688-5,849 ft. in Upper Cretaceous F zone. Flow through 15/64-in. choke. TD 7,664 ft. Field discovery in West Butte area.

WESTERN CANADA

Alberta:

Pan American-B.A. 4-35 Swan Hills, LSD 4, 35-65-10w5. Beaverhill Lake Oil discovery. TD 6,531 ft.

Great Plains-B.A. 10-15 Lousana, LSD 10, 15-36-22w4. D2 oil discovery. TD 7,098 ft.

Swain 14-11 Leafland, LSD 14, 11-40-5w5. Cardium oil discovery. TD 7,000 ft.

B.A.-McKonkey 7-34 Munson, LSD 7, 34-30-20w4. Glauconitic gas discovery. TD 7,240 ft.

Hamilton 10-11 Viking, LSD 11, 10-47-12w4. Gas discovery. TD 2,974 ft.

BRITISH COLUMBIA

Western Natural-Imperial b-78-J Clarke Lake, b-78-J-94-J-9. Slave Point gas discovery. TD 6,520 ft.

Texaco-NFA b-68-K Tsea, b-68-K-94 P-5. Slave Point gas discovery. TD 7,110 ft.

Texaco-NFA c-53-D Judy, c-53-D-94-P-6. Mississippian gas discovery. TD 7,323 ft.

COLORADO

Mesa County, Asbury Creek area:

Frontier Refining Co. 1 Christiana-Government, SW SE 9-9s-101w. IPF 4,653 M.c.f.d., 4 hours, CP 815 psi., TP 805 psi., shut in. Buckhorn open hole 2,597-2,603 ft. TD 2,603 ft. Buckhorn discovery, new field.

KANSAS

Ford County:

Russell Cobb, Jr. 1 Turley, 10 miles northwest of Willroads pool, 3½ miles southwest of Dodge City in C NW SE 6-27s-25w. IPF 3 M.M.c.f.d., Krider 2,647-87 ft. TD 2,900 ft. PBTD 2,764 ft. New gas discovery.

MICHIGAN

Missaukee County:

N. N. Donley 1 Baas, SE SE SW 25-21n-7w, 2 miles southeast Riverside pool. NIP 890 M.c.f.d. Elevation 1,191. Stray sand 1,393, pay 1,396. TD 1,406 ft. New pool discovery.

(Continued on page 183)

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Land Office, Cheyenne, Wyoming. Notice is hereby given that 17 parcels of land totaling 1,869.41 acres within the known geologic structures of a number of fields in Fremont, Natrona, Park, Sweetwater and Weston Counties, Wyoming, are offered for competitive oil and gas leasing through sealed bids to the qualified bidder of the highest cash amount per acre at 2:00 P.M., MST, June 7, 1961, when bids will be opened. Full details of the offering, and how and where to submit bids, may be obtained from the Land Office, Cheyenne, Wyoming. Arvin H. Olswold, Chief, Minerals Section.

This advertisement is neither an offer to sell nor a solicitation of an offer to buy any of these securities. The offering is made only by the Prospectus. This is published on behalf of only such of the undersigned as are qualified to act as dealers in securities in the respective States.

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Lazard Frères & Co. — Lehman Brothers — Merrill Lynch, Pierce, Fenner & Smith Incorporated

Paine, Webber, Jackson & Curtis — Smith, Barney & Co. Incorporated — Dean Witter & Co.

Richard Wagner . . . tax reform is high on his list.

Wagner Has a Broad Outlook

. . . on business. New president of U. S. Chamber thinks oil will flourish if the general economy is healthy.

IT IS SOMETIMES charged that oil men concentrate so hard on oil they fail to realize a problem facing their industry may be a problem facing business in general—and that a joint approach might produce the best solution.

Such a complaint could not be lodged against Richard Wagner, board chairman and chief executive officer of Champlin Oil & Refining Co.

In fact, Wagner has been elected president of the U. S. Chamber of Commerce because he has taken such an active role in tackling broad problems that he feels affect the economic climate generally.

Wagner, who will hold the presidency for a year beginning May 2, obviously figures that if the over-all business climate is good the oil industry will thrive.

He hopes to lead a national campaign aimed at improving business conditions as a necessary stimulant to general economic health and well-being.

As one step, he advocates a thorough overhaul of the nation's tax structure, with particular emphasis on the need for encouraging venture capital.

"That's the seed corn of business," he says. "Without it, you can't grow next year's economic crop."

Wagner's interest in financial problems comes naturally, for he moved up through banking circles before becoming an oil company official.

His first job was as a bank runner. The wages: $5 a week. The hours: 8 a.m. to 10 p.m.

He managed to attend night classes long enough to get his high school diploma. Then he attended Northwestern University and the American Institute of Banking.

By 1929 he was a vice-president of the bank, Continental Illinois National Bank and Trust Co. of Chicago. He soon had thrust upon him the role of "doctor" for many firms that were near death's door economically because of the crash of '29 and the lean days that followed.

One such firm was the Chicago Corp., an investment trust that was badly shaken at the time. Wagner was vice-president of this corporation for 8 years, then became its president.

The prescription he wrote for the ailing firm: Apply venture capital liberally to a wide variety of industries.

Wagner's firm wound up concentrating on oil investments. In 1954 it bought the Champlin Co., a family-owned independent with headquarters at Enid, Okla.

Taking over the name of the newly acquired property, Wagner's firm became a fully integrated producing, refining, and marketing oil company. It expanded rapidly and now has executive offices in Chicago and operating headquarters in Fort Worth.

At 64, Wagner is a robust man with astonishing drive. He is pleasant and affable, yet it is obvious that he is a man of strong opinion.

His hobbies include geology, golf, fishing, music, and poetry. And tax reform.

●

George Ashland, district geologist for Humble Oil & Refining Co. in Worland, Wyo., has been transferred to Casper, Wyo.

E. Forbes Gordon, petroleum engineer for Texaco Inc. in Houston, has been transferred to Harvey, La., as district petroleum engineer.

E. Clay Warren, geologist for California Oil Co. in Billings, Mont., has been transferred to Vernal, Utah. **A. J. Hruby,** Denver, will succeed Warren in Billings. **Frank Kelly,** geologist in Salt Lake City, and **Robert Wellborn,** Northern Rockies geologist, also have been assigned to the Billings office.

Four product managers in chemicals research have been appointed by Esso Research & Engineering Co. They are: **Dr. Robert W. Krebs,** manager for synthetic rubber; **Dr. Daniel S. Maisel,** manager for industrial chemicals; **Edwin J. Newchurch,** manager for plastics; and **Dr. Lloyd A. Nicolai,** manager for chemical raw materials.

Personals

F. B. Neptune, Phillips Petroleum Co., has been named president of Dixie Pipeline Co., new firm which plans to build a 1,100-mile LPG system into the southeastern states. Other officers will be **R. P. Lennart,** Service Pipe Line Co., and **E. A. Slade,** Okan Pipeline Co. (Warren Petroleum affiliate), vice presidents; **C. J. Senger,** Warren Petroleum Corp., treasurer; and **R. A. McIntyre,** Tuloma Gas Products Co., secretary. Owners of Dixie are Warren, Phillips, Tuloma, Humble Pipe Line Co., Union Texas Natural Gas Corp., Shell Oil Co., Sinclair Pipe Line Co., and Empire Gas & Fuel Co., a Cities Service affiliate.

NEPTUNE

D. O. Buie has been promoted to district foreman in Interstate Oil Pipe Line Co.'s Sunset (Louisiana) district.

John Holder, electrical and communications supervisor for Service Pipe Line Co., has retired after 41 years with the company.

Gordon Anderson, survey chief in Owatonna, Minn., for Northern Natural Gas Co., has been named area engineer in Minneapolis. **Harold Winterstein,** assistant processing-plant superintendent in Mitchell, Tex., has been named compressor-plant superintendent in Hooper, Neb. **Ralph Preston** will succeed Winterstein in Mitchell. **Dale Coates,** graduate-engineer trainee, has been named flow-studies engineer in the Omaha office.

Martin Berg, Jr., project engineer with Williams Brothers Co. in Tulsa, has joined Milwaukee Gas Light Co. as district design engineer in Milwaukee.

Fred S. Jones, superintendent of engineering and communications for Platte Pipe Line Co., has been promoted to chief engineer. He has been with the company since 1952.

E. H. Morgan, division foreman for Salt Lake Pipe Line Co. in Boise, Idaho, has retired after 33 years with the company.

Carl D. Faires, chief engineer in Indianapolis for Shell Oil Co.'s products-pipelines section, has been transferred to New York as assistant to the technical manager of the pipeline department. **Carter L. Shea,** line superintendent in Zionsville, Ind., will succeed Faires in Indianapolis.

W. Scott Hayden, production engineer for Humble Oil & Refining Co.'s southeastern region in Grand Isle, La., has been transferred to the central region in Tulsa.

J. A. Warder, president of Cia. Shell de Venezuela, has been named regional coordinator for the Royal Dutch-Shell companies in the Middle East and a director of Shell International Petroleum Co. **Gerrit A. Wagner,** vice president of Shell de Venezuela, will succeed Warder as president.

Organization plan of Humble's central region in Tulsa has been completed. Operations management in the region consists of **John W. Brice,** vice president; **R. O. Goodykoontz,** general manager; and **W. E. Eiting, Jr.,** assistant general manager. The regional coordinating committee will include these three men and **Thomas Brownfield, R. P. Ryan, W. W. Turnbull,** and **C. D. Hill.** Exploration and production in the central division will be divided into four operating areas with offices in Oklahoma City, Denver, Billings, Mont., and Mattoon, Ill. Managers of the four areas are: **J. J. Mullane,** Oklahoma City; **R. D. Sloan,** Denver; **R. W. Gemmer,** Billings; and **A. L. Deaton,** Mattoon. Marketing will be coordinated by area offices in Chicago and Billings. **G. T. Phipps** is Billings marketing manager, and **R. R. McCoy** heads the Chicago marketing area. Operating department managers in the Tulsa regional office include **W. W. Turnbull,** exploration; **O. D. Harper,** production; **C. D. Hill,** marketing; **J. O. Campbell, Jr.,** crude oil and gas sales. **LeRoy Young** is administrative assistant to the vice president and general manager in Tulsa.

Cliff C. Ditzler, tool pusher with Marlin Exploration, Inc., has been named production foreman in the Natchez, Miss., district of Marlin and Petersen Drilling Co. He succeeds **M. P. (Pete) Kilgore,** who has resigned.

J. L. Byrd, planning and economics adviser for the transportation-coordination department of Standard Oil Co. (N. J.) in New York, will move to London May 1 as assistant Eastern Hemisphere representative, transportation-coordination department.

R. C. Earlougher, Earlougher Engineering Co., Tulsa, has been elected chairman of the Mid-Continent district of API's Division of Production. He succeeds **John Albright,** Cities Service Petroleum Co., Bartlesville, Okla., who has been named chairman of the district advisory committee. **R. J. Hall,** Liberty Manufacturing Co., Oklahoma City, has been elected secretary-treasurer. New district vice chairmen and their areas are: **James Austin,** Austin Drilling Co., Seminole, Okla., area; **E. B. Krider,** National Cooperative Refinery Association, Great Bend, Kans., Kansas area; **W. H. McPhail,** Tidewater Oil Co., Drumright, Okla., area; **Max A. Bolick,** Cities Service Petroleum, Pampa, Tex., Texas Panhandle area; **W. R. Cook,** Duncan, Okla., Arbuckle area; **Homer Austin,** Phillips Petroleum Co., Pauls Valley, Okla., Golden Trend area; and **Warren Richardson,** Cameron Oil Co., Oklahoma City area.

EARLOUGHER

ALBRIGHT

Harold T. Cruikshank, Jr., Standard Oil Co. (N. J.), marketing adviser for Europe, the Mediterranean, and West Africa, has been named deputy marketing coordinator. **W. H. Johnson,** assistant marketing adviser for France, Benelux countries, Austria, Germany, Switzerland, and Italy, will succeed Cruikshank.

POORMAN

Glenn W. Poorman, senior vice president for supply and a director of Esso Export Corp., has been elected executive vice president of the company. **M. A. Matheson,** senior Eastern Hemisphere adviser in London, has been elected to the Esso Export board.

W. S. Scruggs, Jr., field foreman with Placid Oil Co., has been transferred to Laurel, Miss., from Gilbertown, Ala.

Joseph J. Simmons III, superintendent of drilling and production and secretary-treasurer of Simmons Royalty Co., Muskogee, Okla., has been appointed Interior Department adviser to the Office of Civil and Defense Mobilization on oil and gas matters. He will be responsible for coordinating Interior's oil and gas mobilization plans with OCDM.

F. W. Turner, manager of Atlantic Refining Co.'s production division in Dallas, has been named manager of the company's new eastern region. **Robert T. Cox,** manager of the present West Texas-New Mexico region, will be western region manager. The changes are first appointments announced in a major reorganization of Atlantic's domestic production department. (For details see page 84.)

Four new directors were elected at Western Petroleum Refiners Association's annual meeting in San Antonio, Tex., last week. They are: **W. K. Davis,** Premier Oil & Refining Co., Houston; **J. L. Nolan,** Farmers Union Central Exchange, St. Paul, Minn.; **S. S. Seltzer, Jr.,** Southwestern Oil & Refining Co., Corpus Christi, Tex.; and **Edwin Singer,** Pontiac Refining Corp., Corpus Christi. **W. J. Carthaus** was re-elected president, and **Stanley Breitweiser,** DX Sunray Oil Co., Tulsa, was named to succeed **J. Porter Langfitt,** Pure Oil Co., as vice president. Langfitt became a director. For a report on WPRA meeting and pending merger with NPA, see page 77.

Tom L. Holland has been named district land man for Anadarko Production Co. in Kansas, Nebraska, Colorado, and the Texas and Oklanoma Panhandle areas.

Douglas M. Pogue, senior petroleum engineer with Creole Petroleum Corp. in Caracas, has joined Daystrom, Inc., in La Jolla, Calif., as chief systems analyst, oil and gas, in the control-systems division.

N. Homer White, technical-services manager for International Refineries, Inc., in Wrenshall, Minn., has joined Golden Eagle Refining Co. as assistant engineering and construction manager **Jack W. Dallman,** senior engineer, will succeed White with International Refineries. **Paul Strain,** economic analyst for International Refineries, has been named administrative assistant to the vice president and general manager.

Don D. Matson, seismologist for Midwest Oil Corp. in Denver, has been named West Texas manager of exploration in Midland, Tex. **J. R. Rowan** has been named head of the land department in Midland. **John A. Croom** has been named land department head in Fort Worth. He succeeds **Bert M. Nunnallee,** who has resigned. **W. E. Golden,** land man, has been transferred to the new Fort Smith, Ark., office from Calgary.

A new slate of directors has been elected by Macmillan Petroleum Corp., Los Angeles. Changes in the board follow purchase of a large block of stock by Founders Corp., New York investment firm. The new nine-man Macmillan board includes **Robert G. Munro,** president of Founders; **Earle S. Willoughby,** Founders vice president; **Philip Gandert,** Founders vice president; and **Joseph P. Kane,** Founders director and director and secretary of Golden Eagle Refining Co. Three other Golden Eagle officials have been named Macmillan directors. They are **John M. Shaheen,** Golden Eagle president; **Harvey R. Fifer,** vice president; and **David Oreck,** vice president and general manager. **Charles E. Stimson, Jr.,** of Adams, Duque & Hazeltine, attorneys, and **Roger Q. White,** Chicago attorney, complete the new Macmillan board.

▶▶▶ Personals

R. L. Adams, production manager of Continental Oil Co.'s CATC marine region, has been promoted to general manager of the western region. He will headquarter in Los

ADAMS

O'LEARY

Angeles. Adams succeeds **J. P. Malott,** recently named vice president and general manager of production in Houston. **F. T. O'Leary,** regional superintendent of natural gasoline and gas operations in Houston, has been promoted to production manager, CATC marine region, succeeding Adams. Adams has been with Conoco since 1946, O'Leary, since 1951.

John R. Busley, geologist with Standard Oil Co. of Texas, has been transferred to Monahans, Tex., from Midland, Tex.

Halsted H. Park, Jr., H. H. Park, Inc., Katonah, N. Y., has been elected president of Empire State Petroleum Association. He succeeds **Harry Cool,** George Hall Corp., Ogdensburg, N. Y.

John S. Leonard, assistant manager in charge of wholesale sales for Texaco's Dallas division, has been named manager of asphalt sales for the domestic sales department. He will headquarter in Houston. Leonard succeeds **Theodore R. Ellis,** who has retired after 25 years with the company.

Everette A. Skarda has been named general manager of Dansk Veedol, Tidewater Oil Co.'s Danish subsidiary which is building a 20,000-bbl. refinery in Kalundborg, Denmark. Skarda had been zone manager of Getty Oil Co.'s Saudi Arabia-Kuwait Neutral Zone operations since 1957. In Denmark he succeeds **George M. Dixon,** who is returning to a new assignment with Tidewater in the United States.

Personals

Howard Armentrout, division geologist with Calvert Exploration Co., has resigned to join Globe Petroleum Co., Bismarck, N. D., as exporation manager.

N. B. Kaigler has been promoted to staff engineer in the technical division of Humble Oil & Refining Co.'s Baytown, Tex., refinery. He will be responsible for mechanical engineering design of refinery and petrochemical processing units.

Dr. J. P. Woods, Atlantic Refining Co., Dallas, and **T. A. Manhart,** Century Geophysical Corp., Tulsa, received silver anniversary certificates at the midwestern exploration meeting of Society of Exploration Geophysicists last week in Oklahoma City. The awards recognized 25 years continuous SEG membership and service. Woods is currently SEG president.

K. A. Stephens, western sales division manager for Texaco Canada in Calgary, has been transferred to Toronto as Ontario division manager. He succeeds **J. C. Wattie,** recently named general manager of sales.

Owen A. Thomas, plant engineer for H. K. Porter Co., has joined Oil Recovery Corp. in Tulsa as mechanical engineer. **Gene F. Vance,** project engineer, has been named petroleum engineer in the Tulsa office.

Robert P. Ferguson, manager of economic and marketing research for Humble's Esso Standard division, has been named head of the planning and research division in the marketing coordinating department of Standard Oil Co. (N. J.), the parent company. **Arthur A. Draeger,** Esso Standard division assistant manager of marketing for New York State, will succeed Ferguson.

Wallace Mann, geologist with Humble Oil & Refining Co., has been transferred to Grand Isle, La., from New Orleans.

Richard R. Gregory, geophysicist with Sohio Petroleum Co., has been transferred to Houston from Midland, Tex.

L. E. Vandever, production foreman for Sinclair Oil & Gas Co., has been transferred to Andrews, Tex., from Loco Hills, N. M.

P. E. Patterson, production foreman for Mobil Oil Co. in Wilmington, Calif., has been given a temporary assignment in Santa Fe Springs, Calif., as production engineer.

Dr. S. Z. Perry has been named manager of the service division of Shell Development Co.'s Emeryville, Calif., research center. He had been head of the analytical department there.

Deaths

F. J. Adams, retired vice president of Gulf Oil Corp., died April 10 in Fort Worth. Adams was in charge of Gulf's Fort Worth production division when he retired in 1953.

Otto Dewey Donnell, 77, retired president of Ohio Oil Co., died April 9 in a Findlay, Ohio, hospital. He was the son and father of Ohio Oil presidents. He succeeded his father, the late J. C. Donnell, as president in 1927. His son, J. C. Donnell II, is now president of the company. Donnell was a charter member of American Petroleum Institute and served it in many capacities. In 1953 he received the association's gold medal for distinguished achievement. He retired from Ohio in 1948.

S. Miller Williams, Jr., 73, Robinson, Ill., one of the founders and former president of Williams Brothers Co., died April 6 in Terre Haute, Ind. Williams suffered a heart attack while on a business trip. He and his brother, David R. Williams, Sr., of Camden, S. C., founded the construction firm in 1908. Both brothers retired from the company in 1950. In 1959, Williams was named Grand Old Man of Transportation at the International Petroleum Exposition in Tulsa.

Charles R. Eckes, Sr., 76, former chief geologist for Texaco Inc. in Caracas, died April 12 in a Tulsa hospital of cancer. Eckes was one of the founders of American Geological Society.

Hubert E. Clift, 75, Houston independent operator, died April 7 in a Houston hospital after a long illness. Clift was with Amerada Petroleum Corp. and Rycade Oil Co. before becoming an independent in 1935.

James Burl Preston Hollingsworth, 69, retired main line engineer for Gulf Oil Corp., died April 8 in a Tulsa hospital. Hollingsworth was with Gulf 36 years before he retired in 1957.

Charles A. Hughes, 85, executive secretary and a director of Southern Petroleum Co., died April 9 in Memphis. He had been with Southern Petroleum 25 years.

Irene Gadelman, 71, retired assistant secretary of Service Pipe Line Co., died April 8 in Tulsa. Miss Gadelman retired in 1949.

Harry B. Friggle, 78, retired Franklin, Pa., oil producer, died April 9 at his home in Franklin.

Douglas T. Bolling, 68, Owensboro, Ky., independent producer, died April 5 in a Louisville, Ky., hospital. Bolling had been active in Tri-State oil operations since 1920.

Victor E. Gallucci, 57, president of Samuel E. Gallucci & Sons, Inc., Corona, Long Island, N. Y., pipeline construction firm, died April 10. His company laid the pipeline across the narrows in 1952 which brought natural gas to New York City.

Arthur E. Jago, 59, manager of transportation and supply for Shell Oil Co. in Houston, died April 12 at his home of heart disease. Born in Singapore and educated in England, Jago worked for Royal Dutch-Shell before joining Shell Oil in St. Louis. He had been in Houston since 1936.

How refiners have shifted crude sources

BY JOHN C. CASPER

A quick look at the highlights . . .

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	7,240,325	DOWN	107,900	UP	195,722
Crude stocks	243,193,000	UP	4,593,000	DOWN	15,034,000
Completions	954	UP	17	UP	232
Refinery runs	7,899,000	UP	44,000	DOWN	136,000
Gasoline stocks	225,659,000	DOWN	790,000	UP	664,000
Kerosine stocks	26,619,000	UP	613,000	UP	8,398,000
Distillate stocks	88,507,000	DOWN	1,170,000	UP	14,088,000
Residual stocks	42,517,000	UP	256,000	UP	3,144,000
Four-product stocks	383,302,000	DOWN	1,091,000	UP	26,294,000
Total imports	1,614,700	DOWN	532,700	DOWN	55,300

WHERE DO REFINERS in your state get their crude? What portion of the total is produced within the state? Are they using more local crude than in the past? If your state is a major producing and refining area, the answers may be in the table to the right.

Let's start with Texas. Shipments of crude into Texas for refining increased from 345,700 bbl. daily in 1956 to 506,200 bbl. daily in 1960. Reported interstate movement covers only shipments to Texas refineries and does not include crude sent to Gulf Coast ports for reshipment.

For the 1956-60 period, shipments to Texas from Louisiana increased from 172,800 bbl. daily to 340,200 bbl. daily. The volume of crude from New Mexico was off slightly in 1960 but totals ranged from 150,000 to 160,000 bbl. daily for other years. Reseipts from Oklahoma gained about 17,000 bbl. daily. Rocky Mountain crude started coming to Texas in 1958.

In contrast with out-of-state crudes, less Texas crude moved to Texas refineries in 1960 than in either 1956 or 1957.

Louisiana receipts of crude from other states increased 2,600 bbl. daily in 1960, but the total was in line with the 5-year average. Crude from Texas showed a small gain in 1960, but there was a general reduction for the 5-year period.

Intrastate receipts for Louisiana averaged 506,100 bbl. daily in 1959 but dropped back to 464,000 bbl. daily last year.

Oklahoma refiners have increased their purchases of out-of-state crude, with principal gains in shipments from Texas and the Rocky Mountain area. Kansas refiners have been taking crude from Texas, Oklahoma, New Mexico, and the Rocky Mountain areas. Volume has averaged about 62,000 bbl. daily for recent years.

Data for Illinois and Indiana are included to show growth in movement of Rocky Mountain crude to the Great Lakes area. The 4-year gain was 95,000 bbl. daily compared with the 69,000-bbl. gain in intrastate receipts.

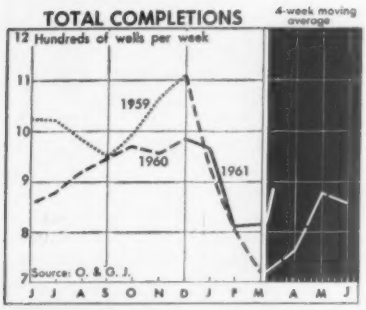
Figures for all tables are from Monthly Petroleum Statements of the Bureau of Mines. For a detailed report on destination of imported crude as well as crude from major producing states, check tables on pp. 58-60 of March 27 Journal.

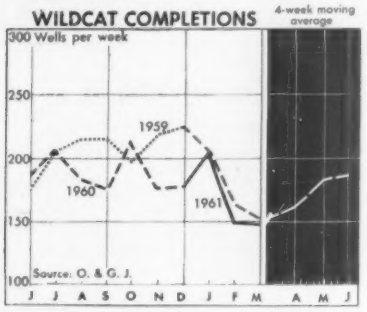
Refinery Receipts of Domestic Crude

(Thousands of barrels daily)

Shipped from—	1956	1957	1958	1959	1960
Received by Texas Refineries					
Louisiana	172.8	195.2	232.9	270.9	340.2
New Mexico	159.6	154.7	150.2	155.7	129.6
Oklahoma	4.8	3.4	10.4	9.5	21.9
Rocky Mountain	.....	.....	7.2	9.7	13.4
Ala.-Miss.	5.5	2.0	1.9	2.9	1.1
Other	3.0	1.0	.....	.....	.....
Total interstate	345.7	356.3	402.6	448.7	506.2
Intrastate	1,856.6	1,781.3	1,571.4	1,658.0	1,681.2
Received by Louisiana Refineries					
Ala.-Miss.	60.2	58.7	59.6	86.8	89.1
Texas	134.7	108.5	98.0	83.2	87.5
Arkansas	35.0	36.4	32.1	26.4	23.6
Other	.....	.....	2.5	1.3	0.1
Total interstate	229.9	203.6	192.2	197.7	200.3
Intrastate	470.7	445.1	435.5	506.1	464.0
Received by Oklahoma Refineries					
Texas	39.8	41.5	47.2	61.2	51.9
Rocky Mountain	.....	.....	3.7	20.7	22.2
Kansas	34.4	34.4	31.6	28.6	24.7
Other	2.8	0.6	3.2	2.0	4.3
Total interstate	77.0	76.5	85.7	112.5	103.1
Intrastate	267.8	270.3	259.7	256.8	254.3
Received by Kansas Refineries					
Oklahoma	30.0	26.2	25.7	26.8	27.1
Rocky Mountain	25.6	23.9	14.0	15.0	14.7
New Mexico	.....	8.2	12.8	13.7	15.4
Texas	37.8	18.7	7.6	7.8	6.4
Other	.....	.....	.....	.....	.....
Total interstate	93.4	77.0	60.1	63.3	63.6
Intrastate	179.6	207.7	227.8	236.1	236.9
Received by Illinois-Indiana Refineries					
Texas	374.5	337.5	352.1	363.6	331.1
Oklahoma	148.5	149.1	141.5	172.7	151.9
New Mexico	30.7	34.9	23.0	26.1	53.3
Kansas	106.7	109.0	108.4	96.4	84.7
Rocky Mountain	145.2	173.0	199.2	202.4	239.9
Other	13.7	27.7	21.8	22.3	27.7
Total interstate	819.3	821.2	846.0	883.5	888.6
Intrastate	77.0	66.7	62.3	68.6	76.9

Active Rotary Rigs





	4-10-61	4-3-61	4-11-60
Alabama	4	4	4
Alaska	8	7	5
Arkansas	12	15	12
Arizona	0	0	4
California	74	69	86
Land	72	65	82
Offshore	2	4	4
Colorado	20	20	21
Florida	0	0	2
Land	0	0	1
Offshore	0	0	1
Georgia	1	1	0
Illinois	26	17	29
Indiana	5	4	3
Kansas	108	98	120
Kentucky	3	2	3
Louisiana	268	266	303
North	28	23	36
S. Inland waters	106	104	128
S. Land	77	82	83
Offshore	57	57	56
Michigan	16	15	26
Mississippi	45	57	60
Missouri	1	1	1
Montana	22	15	14
Nebraska	23	30	31
New Mexico	96	85	106
New York	0	0	1

	4-10-61	4-3-61	4-11-60
North Dakota	16	19	17
Ohio	6	6	4
Oklahoma	168	160	211
Pennsylvania	7	7	11
South Dakota	0	0	1
Texas	602	598	629
S. Inland waters	8	9	10
S. Land	171	167	156
Offshore	3	3	1
North	55	56	47
Panhandle	41	50	55
East	55	55	60
West Central	162	151	196
West	107	107	104
Utah	26	31	32
Washington	2	2	0
West Virginia	4	4	4
Wyoming	54	44	60
Total U. S.	1,617	1,577	1,800
Cum. avg. to date	1,565	1,561	1,689
Western Canada	99	138	114
Eastern Canada	0	0	2
Grand total	1,716	1,715	1,916

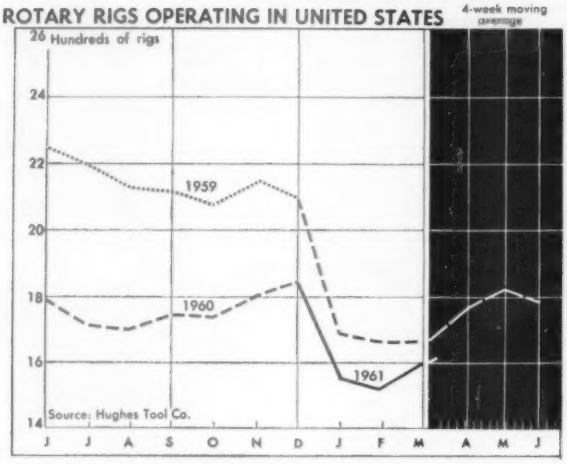
Hughes Tool Co. report.

WEEKLY WELL COMPLETIONS . . . WEEK ENDED APRIL 8, 1961

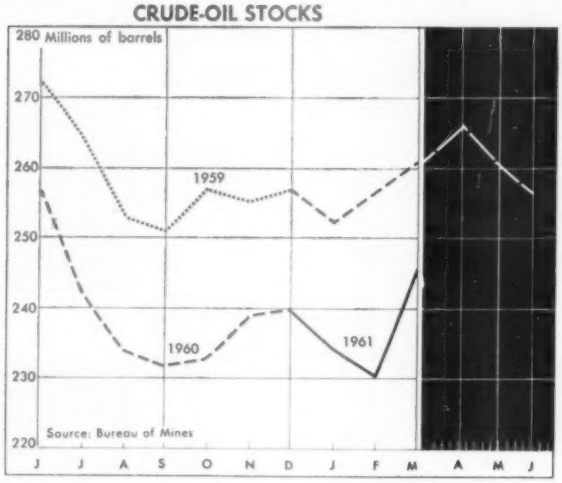
	Total wells							Cum.		Total wildcats					Cum.	
	Total	Crude	Cond.	Gas	Dry	Service	Footage	1961	1960	Total	Crude	Cond.	Gas	Dry	1961	1960
Arkansas	7	2	0	1	4	0	21,525	146	155	3	1	0	1	1	29	41
California	37	24	0	5	7	1	121,359	470	354	7	0	0	3	4	74	76
Colorado	10	1	0	1	8	0	54,697	176	192	4	0	0	0	4	94	88
Illinois	9	4	0	0	5	0	14,086	475	566	4	0	0	0	4	95	149
Indiana	7	4	0	0	3	0	8,751	163	225	1	0	0	0	1	37	96
Kansas	90	46	0	3	35	6	282,095	1,449	859	20	4	0	0	16	277	287
Kentucky	76	13	0	30	32	1	147,875	428	493	8	0	0	0	8	48	59
Louisiana	114	61	0	16	37	0	1,044,939	1,012	889	12	0	0	0	12	150	133
North	15	9	0	3	3	0	47,474	331	281	2	0	0	0	2	56	54
South	54	24	0	6	24	0	552,490	522	451	7	0	0	0	7	84	69
Offshore	45	28	0	7	10	0	444,975	159	157	3	0	0	0	3	10	10
Michigan	11	3	0	3	5	0	34,507	181	195	5	0	0	1	4	74	65
Mississippi	6	1	0	0	5	0	53,497	143	227	1	0	0	0	1	50	73
Montana	4	2	0	0	2	0	20,463	108	64	1	0	0	0	1	47	32
Nebraska	25	17	0	0	8	0	102,784	216	206	6	1	0	0	5	87	82
New Mexico	24	16	0	1	7	0	99,745	459	504	1	0	0	0	1	84	67
West	10	5	0	1	4	0	34,858	172	166	0	0	0	0	0	21	13
East	14	11	0	0	3	0	64,887	287	338	1	0	0	0	1	63	54
New York	8	0	0	5	3	0	26,149	183	100	5	0	0	2	3	7	7
North Dakota	6	2	0	0	4	0	40,191	60	84	3	0	0	0	3	16	13
Ohio	24	6	0	5	5	8	56,748	287	310	0	0	0	0	0	11	14
Oklahoma	132	73	1	11	35	12	448,521	1,651	991	14	0	0	3	11	171	190
Pennsylvania	0	0	0	0	0	0	0	152	128	0	0	0	0	0	7	6
Texas	290	145	10	10	120	5	1,221,143	3,735	4,345	58	7	0	2	49	782	897
District 1	23	15	1	0	7	0	52,495	223	312	4	0	0	0	4	83	115
District 2	15	5	3	2	5	0	96,348	181	191	3	0	0	0	3	36	45
District 3	31	13	1	1	16	0	162,290	288	333	1	0	0	0	1	58	68
District 4	18	9	1	2	6	0	89,242	334	335	4	0	0	1	3	71	101
East	14	6	0	0	8	0	64,771	286	308	6	0	0	0	6	70	63
District 7-B	44	15	0	4	25	0	143,587	521	623	21	6	0	1	14	163	183
West	76	47	2	1	26	0	385,624	938	1,158	15	0	0	0	15	196	183
District 9	38	22	1	0	13	2	89,443	613	810	4	1	0	0	3	80	115
District 10	31	13	1	0	14	3	137,343	351	275	0	0	0	0	0	25	24
Utah	10	5	0	1	4	0	48,035	72	69	3	0	0	0	3	32	25
West Virginia	28	2	0	17	4	5	64,449	277	210	0	0	0	0	0	2	1
Wyoming	15	4	0	2	9	0	94,934	283	260	5	0	0	0	5	110	106
Miscellaneous*	21	4	0	0	17	0	43,853	105	58	14	0	0	0	14	74	34
Total U. S.	954	435	11	111	359	38	4,050,346	12,231	11,484	175	13	0	12	150	2,358	2,541
Previous week	937	458	9	92	325	53	4,039,868	.....	.....	165	11	2	7	145	.....	.....
Cum. 1961	12,231	5,610	255	1,215	4,357	794	49,802,558	.....	.....	2,358	195	28	113	2,022	.....	.....
Cum. 1960	11,484	5,347	380	964	4,466	327	50,719,543	.....	.....	2,541	221	28	76	2,216	.....	.....
Western Canada	53	24	0	13	15	1	330,316	677	702	15	3	0	7	5	222	219

*Ala., Mo., Tenn., Wash., Ariz.

ROTARY RIGS OPERATING IN UNITED STATES



CRUDE-OIL STOCKS



CRUDE-OIL STOCKS BY STATES OF ORIGIN*

(Thousands of barrels)

	4-1-61	3-25-61	4-2-60
Pennsylvania	2,089	2,132	2,075
Other Appalachian	1,199	1,297	1,775
Illinois, Indiana, Michigan	9,750	9,331	9,414
Nebraska and North Dakota	3,292	3,182	2,696
Kansas	9,778	9,521	9,464
Oklahoma	15,335	15,726	17,458
Arkansas	1,859	1,692	2,007
Louisiana	18,851	18,468	20,226
North	3,114	3,117	3,341
South	15,737	15,351	16,885
Mississippi, Alabama, Florida	2,490	2,070	2,797
New Mexico	7,696	7,659	7,916
Texas	102,692	99,875	112,147
East Texas	8,797	8,688	8,489
West Texas	46,388	45,184	50,615
Texas Gulf	18,149	17,541	20,060
Other Texas	29,358	28,462	32,983
Wyoming	17,032	16,717	17,423
Other Rocky Mountain	9,357	9,207	9,640
California	25,926	25,147	29,350
Foreign	†15,847	16,576	13,839
Total	**243,193**	238,600	258,227

*Bureau of Mines. †Includes 5,614,000 bbl. in California.

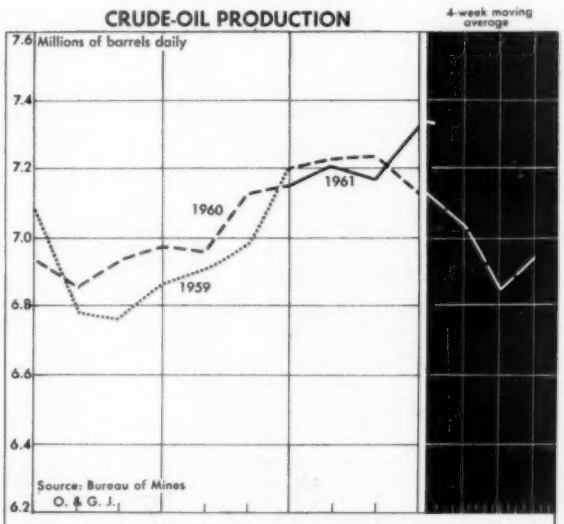
DAILY AVERAGE PRODUCTION FOR WEEK

	April 8, 1961 Crude oil	Lease condensate	Total	Apr. 1 total
Alabama	19,325	.....	19,325	19,300
Alaska	11,000	.....	11,000	10,000
Arkansas	77,450	150	77,600	77,550
California	829,500	.....	829,500	829,000
Colorado	132,700	.....	132,700	131,900
Eastern	41,400	.....	41,400	39,600
Florida	1,100	.....	1,100	1,025
Illinois	213,700	.....	213,700	208,300
Indiana	30,900	.....	30,900	30,600
Kansas	†305,050	.....	†305,050	†309,850
Kentucky	49,800	.....	49,800	48,200
Louisiana	1,002,000	158,300	1,160,300	1,153,725
North	102,000	5,800	107,800	107,725
South	900,000	152,500	1,052,500	1,046,000
Michigan	53,000	.....	53,000	53,100
Mississippi	146,900	4,725	151,625	150,975
Montana	80,200	.....	80,200	81,400
Nebraska	68,000	.....	68,000	67,900
Nevada	400	.....	400	400
New Mexico	304,000	7,400	311,400	307,500
North Dakota	69,500	.....	69,500	67,000
Oklahoma	†523,400	.....	†523,400	†525,000
Texas	2,540,000	94,750	2,634,750	2,758,150
Dist. 1	45,000	2,400	47,400	47,700
Dist. 2	110,000	8,600	118,600	125,800
Dist. 3	312,000	40,000	352,000	368,000
Dist. 4	185,000	14,000	199,000	206,000
Dist. 5	28,000	400	28,400	29,500
Dist. 6	118,000	8,200	126,200	132,000
East Texas field	136,000	.....	136,000	142,000
Dist. 7-B	131,000	400	131,400	134,500
Dist. 7-C	117,000	3,650	120,650	126,850
Dist. 8	1,064,000	11,000	1,075,000	1,142,000
Dist. 9	190,000	3,800	193,800	195,800
Dist. 10	104,000	2,300	106,300	108,000
Utah	87,300	.....	87,300	90,600
Wyoming	387,600	.....	387,600	386,400
Others	‡775	.....	‡775	‡775
Total U. S.	6,975,000	265,325	**7,240,325**	7,348,225
Change from prev. week, down			**107,900**	
Canada	†459,700	.....	†459,700	†516,000

Total U. S. prod., January 1-April 8 ..... 710,085,300 bbl.
Same period last year (crude plus cond.) ..... *704,382,900 bbl.

*Includes 22,637,700 bbl. condensate. †Week ended previous Monday. ‡South Dakota and Arizona.

CRUDE-OIL PRODUCTION



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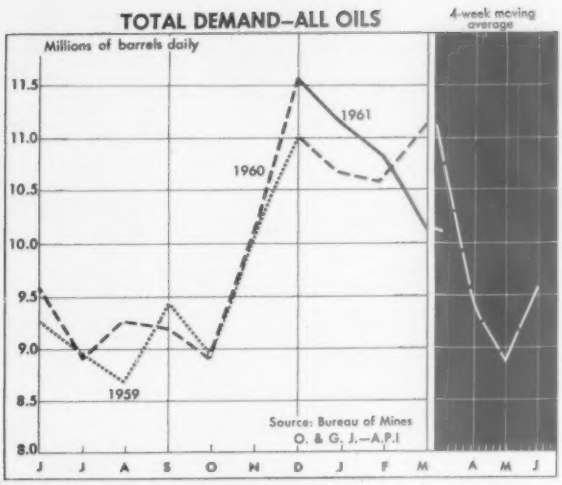

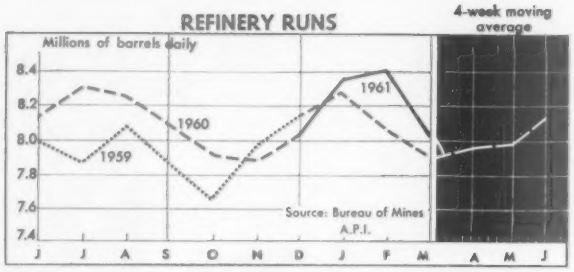

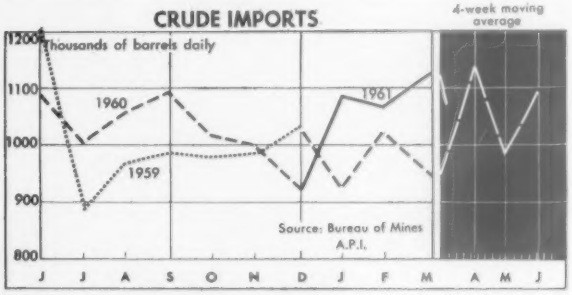

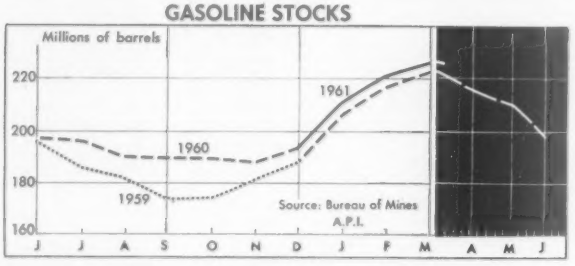

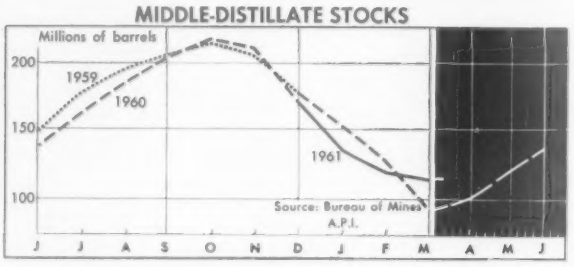

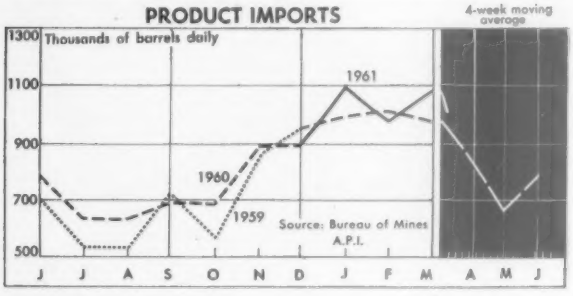

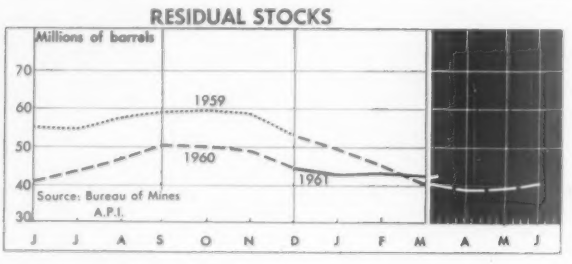

API REFINERY REPORT—APRIL 7, 1961
(Thousands of barrels)

District—	Daily avg. runs	Daily average production—Gaso.*	Kero.	Dist.	Resid.	Stocks‡—Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, April 1960—Daily avg. runs	Daily average production—Gaso.*	Kero.	Dist.	Resid.
East Coast	1,119	474.8	34.6	309.9	143.8	51,192	10,184	26,808	11,677	1,057	510.8	30.1	300.0	146.7
Appalachian:														
Dist. 1	80	37.9	1.6	20.9	9.7	5,718	651	1,810	596	100	41.9	2.9	23.3	12.3
Dist. 2	92	44.9	5.7	15.7	13.6	2,915	451	945	408	90	46.2	4.2	16.6	15.2
Ind., Ill., Ky.	1,427	743.8	89.1	269.4	135.4	42,888	4,456	15,816	5,326	1,480	765.8	77.8	301.0	166.3
Minn., Wis., Dak.	127	61.3	6.0	28.0	17.7	6,878	638	4,300	657	116	56.1	6.4	27.7	14.3
Okla., Kans., Mo.	706	382.6	14.9	155.0	11.3	21,298	1,270	8,677	986	694	350.0	17.4	151.5	14.6
Inland Texas	302	207.3	5.7	54.4	16.7	8,443	643	1,592	2,529	283	212.8	8.2	51.4	20.7
Texas Gulf Coast	1,900	994.7	123.7	453.1	182.6	31,687	3,246	7,376	4,453	1,885	964.0	93.9	439.5	141.2
La. Gulf Coast	658	317.3	65.4	127.7	46.7	11,353	2,496	4,109	1,488	665	366.6	46.9	154.7	48.8
N. La. and Ark.	111	71.8	7.3	21.4	7.3	6,288	598	2,341	157	106	65.2	5.5	21.6	4.7
Rocky Mountain:														
New Mexico	26	11.8	0.4	5.7	2.7	732	44	231	94	23	11.4	0.1	4.3	2.5
Other Rocky Mt.	258	125.3	3.9	54.4	28.6	7,964	357	2,190	1,026	265	114.4	1.5	60.7	24.1
West Coast	1,093	523.6	52.0	96.4	245.6	28,303	1,585	12,312	13,120	1,196	541.3	29.9	191.0	268.9
Apr. 7, 1961	7,899	3,997.1	410.3	1,612.0	861.7	225,659	26,619	88,507	42,517	7,960	4,046.5	324.8	1,743.3	880.3
Mar. 31, 1961	7,855	4,101.1	418.7	1,713.6	885.0	226,449	26,006	89,677	42,261	.....	.....	.....	.....	.....
Apr. 8, 1960	8,035	4,097.1	393.6	1,805.4	987.6	224,995	18,221	74,419	39,373	.....	.....	.....	.....	.....

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines.

CRUDE-OIL PRICES

GRAVITY SCHEDULE

	Signal Hill, Calif.	Oklahoma	West Tex. (sour)	West Tex. (Inter.)	No.* Texas	Texas Refugio Light	Bayou Sale (La.)	Denver Jules-burg	Wyo. (sour)
14-14.9	$1.86	....	....	....	....	....	....	....	....
15-15.9	1.93	....	....	....	....	....	....	....	$1.81
16-16.9	2.00	....	....	....	....	....	....	....	1.86
17-17.9	2.06	....	....	....	....	....	....	....	1.91
18-18.9	2.13	....	....	....	....	....	....	....	1.96
19-19.9	2.20	....	(†)	....	....	....	....	....	2.01
20-20.9	2.27	$2.49	$2.35	$2.61	$2.29	$2.95	$2.90	$2.58	2.06
21-21.9	2.33	2.52	2.38	2.63	2.33	2.97	2.92	2.60	2.11
22-22.9	2.40	2.55	2.41	2.65	2.37	2.99	2.94	2.62	2.16
23-23.9	2.46	2.58	2.44	2.67	2.41	3.01	2.96	2.64	2.21
24-24.9	2.53	2.61	2.47	2.69	2.45	3.03	2.98	2.66	2.26
25-25.9	2.60	2.64	2.50	2.71	2.49	3.05	3.00	2.68	2.31
26-26.9	2.67	2.67	2.53	2.73	2.53	3.07	3.02	2.70	2.36
27-27.9	2.74	2.70	2.56	2.75	2.57	3.09	3.04	2.72	2.49
28-28.9	2.81	2.73	2.59	2.77	2.61	3.11	3.06	2.74	2.54
29-29.9	2.87	2.76	2.62	2.79	2.65	3.13	3.08	2.76	2.59
30-30.9	2.93	2.79	2.65	2.81	2.69	3.15	3.10	2.78	2.63
31-31.9	3.00	2.82	2.68	2.83	2.73	3.17	3.12	2.80	2.67
32-32.9	3.06	2.85	2.71	2.85	2.77	3.19	3.14	2.82	2.71
33-33.9	3.12	2.88	2.74	2.87	2.81	3.21	3.16	2.84	2.75
34-34.9	3.17	2.91	2.77	2.89	2.85	3.23	3.18	2.86	2.79
35-35.9	3.22	2.94	2.80	2.91	2.89	3.25	3.20	2.88	2.83
36-36.9	3.27	2.97	2.83	2.93	2.93	3.27	3.22	2.90	2.87
37-37.9	3.31	2.99	2.86	2.95	2.95	3.29	3.24	2.92	2.89
38-38.9	....	3.01	2.89	2.97	2.97	3.31	3.26	2.94	2.91
39-39.9	....	3.03	2.92	2.99	2.99	3.33	3.28	2.96	2.93
40-44.9	....	3.05	2.95	3.01	3.01	3.35	3.30	2.98	2.95

*Cooke, Grayson, Montague. †Two buyers announced increase.

FLAT PRICES

Louisiana:
- Sweet Lake $3.00

Texas:
- East Texas 3.05-3.25
- Conroe 3.23-3.53
- Van 3.08

Pennsylvania Grade:
- Bradford $4.75-4.80
- Middle District 4.52
- Southwest Pennsylvania 4.25
- West Virginia 4.17
- Buckeye Grade 4.08

Illinois Basin 3.00-3.05

FOREIGN

Middle East, Persian Gulf: (cargoes f.o.b. lifting port)
- Arabian, 34.0°-34.9°, Ras Tanura $1.80
- Iranian, 34.0°-34.9°, Bandar Mashur 1.78
- Iranian, 34.0°-34.9°, Abadan 1.73
- Iraq, 35.0°-35.9°, Fao 1.72
- Kuwait, 31.0°-31.9°, Mina-al-Ahmadi 1.59
- Qatar, 41.0°-41.9°, Umm Said 1.95

Middle East, E. Mediterranean:
- Arabian, 34.0°-34.9°, Sidon $2.17
- Iraq, Mosul-Kirkuk, 35.0°-35.9°, Tripoli 2.19

Far East (cargoes, f.o.b. Lutong, Sarawak):
- Seria Light, 36° 2.42

Canada:
- Leduc-Woodbend $2.53
- Redwater (Alta.) 2.42
- Weyburn (light) 2.06
- Midale C 1.70

Venezuela:
- Cumbarebo, 47°-47.9°, Tucupido 3.34
- San Joaquin, 40°-40.9°, Puerto La Cruz 3.08
- Oficina, 35°-35.9°, Puerto La Cruz 2.80
- Tia Juana medium, 26°-26.9°, Amuay* 2.30
- Quiriquire, 16.0°-16.4°, Caripito 2.10
- Lagunillas heavy, flat, Las Piedras* 2.10
- Bachaquero, flat, 15°-16°, Las Piedras* 1.88

Prices for all crudes of 24° or lighter vary 2 cents per degree change, up or down. All crudes heavier than 24° vary 2.5 cents per half-degree gravity change.

*Also available at La Salina at 3 cents per barrel less.

TANKER RATES (Long Ton)

(Latest reported spot fixtures)

- ★ Gulf-NY, dirty (ATRS—30%) $2.00
- ★ Carib.-NY, dirty (ATRS—35%) 1.79
- ★ Carib.-UK, dirty (Scale—65%) (11s. 5d.) .. 1.60
- ★ PG-UK, dirty (Scale—62.5%) (24s. 2d.) .. 3.28
- ★ PG-Japan, dirty (USMC—71%) 2.96

★ Denotes change from previous week.

REFINED PRODUCTS

Following quotations are realistic spot prices for refined products moving interstate on Wednesday each week. They may differ from refiners' posted prices and should not be considered as postings.

Light-product prices are in cents per gallon. Residual and crude prices are dollars per barrel. Crude prices are at the well unless otherwise listed.

GASOLINE*

Mid-Continent (Group 3):
- Regular (91 octane) .. 12.25-12.50
- Premium (99 octane) . 15.00-15.25
- Natural gasoline (26-70) 4.5
- Breckenridge 4.0

Gulf Coast (cargoes for coastwise or export movements):
- Regular (90 octane) .. 10.50-11.00
- Regular (92 octane) .. 10.75-11.25
- Premium (98 octane) . 11.75-12.25

California (rack) Los Angeles:
- Regular (90 octane) 11.00
- Premium (94 octane) 12.00
- Premium (100 octane) 13.50

Caribbean area (cargoes):
- Regular (87 octane) 9.50
- Premium (97 octane) 11.625

*Quotations are for octanes shown. Prices usually vary with octane ratings within the regular, premium, and aviation grades.

KEROSINE AND DISTILLATE

Mid-Continent (Group 3):
- Kerosine 42-44 .... 10.375-10.625
- Diesel oil (58 d.i. and above) 10.00-10.25
- Distillate No. 1 .... 10.00-10.25
- Distillate No. 2 .... 9.00-9.25

Gulf Coast (cargoes):
- Kerosine 41-43 .... 9.625-9.875
- Distillate No. 2 .... 9.00-9.25

New York Harbor (barges):
- Kerosine 42-43 ..... 11.40
- Distillate No. 2 ..... 10.40
- Diesel fuel, 48-52 d.i. 10.55

Caribbean area (cargoes):
- Distillate No. 2 ..... 8.625

RESIDUAL FUEL (Bbl.)

Mid-Continent (Group 3):
- Residual fuel (max. 1% S) .. $1.90

Gulf Coast (cargoes):
- Bunker C fuel 2.20

New York Harbor (barges):
- Bunker C fuel 2.52

Caribbean (cargoes):
- Bunker C 2.00

California (rack):
- Bunker C fuel, Los Angeles 2.25

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FOR SALE: 1/64 to 24/64 in 3200' well to be drilled offsetting production. Write Lovera Exploration, Box 8024, Dallas 5, Tex.

2-300 bbl. welded tanks with fitting and walk. High and low pressure separators, heater, metering separator. All like new. Lundquist Pipe and Supply Company, Tulsa. LUther 3-9563.

U-15 complete, 131' Mast, 7¾ x 16 Gardner-Denver Pump, 7 Substructure, 3 NK Waukesha Motors, Grade E Drill Pipe, B.O.P. Steel Mud Pits.

1—7¼ x 10 Gardner-Denver Pump

U-15 with 2 NK Motors, 7¼ x 14 Oilwell Pump, no drill pipe or drill collars. Bargain, Lease purchase arrangement available, call General Drilling Company CE 2-6318, Oklahoma City.

MUD PUMP
FOR SALE OR TRADE

7¼" by 14" Gardner Denver Mud Pump, completely gone through, will trade for casing or tubing.

Contact Luke Wise
COMMUNITY GAS & OIL CO.
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Absorbers—1250# to 2100# w.p.

Tanks—150# to 2000 w.p.

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DOUBLE DRUM spudder on IHC Truck. Cooper E563-42-36. Excellent Condition. Box 736, Great Bend, Kansas—GL 3-8817.

CLARK MA-4 Gas Compressor, 150 HP, skid-mounted with radiator and accessories; 2 I.R. XVG6 Gas Compressors; 225 HP Worthington LT6 Compressor; Pumps; Exchangers; Vessels. Brill Equipment Company, 4101 San Jacinto St., Houston 4, Texas.

ONE WELDED gasoline storage tank. 9' x 40'. 20,000 gallons capacity. 40 lbs. W.P. Three steel cradles. Excellent condition. Box M-339, The Oil and Gas Journal, Tulsa, Oklahoma.

HIGHLIGHTS

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12,000 BSD Naphtha
5,000 BSD Heating Oil

POWERFORMER
3,000 BSD Fixed Bed

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Will Be Sold As Units or Piecemeal

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30.7 MM BTU/hr.	CHROME Tubes
19.3 MM BTU/hr.	CHROME Tubes
17 MM BTU/hr.	CHROME Tubes
9.7 MM BTU/hr.	CHROME Tubes
9 MM BTU/hr.	Carbon Tubes
7.5 MM BTU/hr.	CHROME Tubes (2)
5 MM BTU/hr.	Carbon Tubes
2.5 MM BTU/hr.	Carbon Tubes
2 MM BTU/hr.	Carbon Tubes

CENTRIFUGAL BLOWER NEW 1954
7,500 CFM @ 14.4 PSIG SUCTION 42.5 PSIG
Disch. Multi-Stage 8,025 RPM driven by 1,250 HP Synchronous Motor 3/60/2,300/1,200 RPM, 5 KW Direct Conn. Exciter, Falk Speed Increaser 6.70:1 Ratio, Precooler, Intercooler, and Aftercooler.

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3—36' x 35'4" Welded tanks, 6400 bbl. cap.
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NEED IMMEDIATEDLY—Gas Compressor. Capacity: 500-700MCF/Day. Inlet Press: 100 Psig. Discharge Press: 900 Psig. Wire—Write Price to: G. A. Smitherman, Bank of the Southwest Bldg., Houston, Texas.

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AVAILABLE—28 years experience—11 years in production, 3 years marketing, 14 years drilling, roughneck to toolpusher. Foreign service—Phone 322-3550 after 9 P.M. or write William H. Vavra, 1801 Monroe Street, Wichita Falls, Texas.

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SUPERINTENDENT—Pipeline operations, maintenance, construction. Fifteen years foreign & domestic. Heavy experience all administrative duties including safety. Age 43. Speak Spanish. Box M-357, The Oil and Gas Journal, Tulsa, Oklahoma.

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LEGAL

SALE OF OIL AND GAS MINING LEASES, TRIBAL AND ALLOTTED INDIAN LANDS, Department of the Interior, Bureau of Indian Affairs, Uintah and Ouray Agency, Fort Duchesne, Utah. SEALED BIDS will be received until 2:00 P.M. Mountain Standard Time, May 2, 1961, and opened at that time in the office of the Uintah and Ouray Agency, Fort Duchesne, for the leasing of 31,400.22 acres of Tribal Indian lands, and 3,530.42 acres of allotted Indian lands, located in Townships 3, 4 and 5 South, Ranges 1, 2 and 3 East, Uinta meridian, Uintah County, Utah, for oil and gas mining purposes. Details of the lease offering and how and where to file bids may be obtained by addressing an inquiry to the Superintendent, Uintah and Ouray Indian Agency, Fort Duchesne, Utah.

NOTICE

SALE OF OIL AND GAS MINING LEASES, TRIBAL AND ALLOTTED INDIAN LANDS, DEPARTMENT OF THE INTERIOR, BUREAU OF INDIAN AFFAIRS, Fort Peck Indian Agency, Poplar, Montana. SEALED BIDS will be received until 9:00 A. M., Mountain Standard Time, May 2, 1961, and opened at that time at the Fort Peck Indian Agency, Poplar, Montana, for the leasing of 27 tracts of Tribal Land comprising 2,394.17 acres and 341 tracts of individually owned trust or restricted Indian lands, comprising 32,079.56 acres and 8 tracts of land subject to clarification of mineral title comprising 362.62 acres, located in Roosevelt, Sheridan, and McCone Counties, Montana, and Williams County, North Dakota, for oil and gas mining purposes. DETAILS of the lease offering and how and where to file bids may be obtained by addressing the inquiry to the Superintendent, Fort Peck Indian Agency, Poplar, Montana, or telephone Poplar, PO 8-3441.

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Discovery Wells

(Continued from page 170)

MONTANA

Fallon County, Monarch:
Shell Oil Co.-NPRR M-12-15-NP, SW NW 15-9n-58e. IPP 368 BO, 246 BWPD, 34°, Mission Canyon 7,283-7,305 ft. TD 8,256 ft. Mission Canyon discovery, new field.

NEBRASKA

Kimball County:
Champlin Oil & Refining Co. 1 Kosch, C NE NW 13-16n-55w. IPP 74 BO, 18 BWPD, "J" sand open hole 6,085-88 ft. TD 6,088 ft. "J" sand discovery, new field.

Red Willow County, Bartley:
Murfin Drilling Co. et al. 1 Gallatin, C NW NW 32-3n-26w. IPP 25 BOPD, Lansing-Kansas City 3,324-28 ft. TD 3,465 ft. Lansing-Kansas City oil discovery, new field.

NORTHWEST TERRITORIES

Imperial-Sun F-7 Netla, 60° 46', 15.04", N. Lat.; 122°, 46', 15.02" West Longitude. Middle Devonian gas discovery. TD 7,771 ft.

NORTH TEXAS

Young County:
Gulf Oil Corp. 1 T. J. Gardner, 3 miles northeast of Newcastle in Sec. 425, TE&L Sur., A-632. IPF 819 BOPD, 24/64-in. choke, 46.1°, GOR 487:1, packer, TP 800-400 psi. Miss. 4,708-15 and 4,719-42 ft. TD 4,790 ft. New oil discovery.

SOUTH TEXAS

Bee County:
Humble Oil & Refining Co. 2 Laura T. Barrow, 7 miles northeast of Papalote in Pat Downey Sur. A-20. IPAOF: 13,300 M.c.f.d., SICP 2,066 psi., 62.6°, GLR 12 bbl. per million, BH PSI 2,428 psi., Frio 5-634-38 ft. TD 6,176 ft. New gas condensate discovery.

Nueces County:
Forest Oil Corp., Agent 1 State of Texas Tract 708-A, ½ mile north of Corpus Christi in State Tract 708-A, Nueces Bay, IPP 102 BOPD, plus 26% water, 20.7°, GOR 20:1, Catahoula 4,034-36 ft. TD 4,037 ft. New oil discovery.

Victoria County:
W. Placedo discovery. Utex Exploration Co. 1-A Henderson & Pickering, 2 miles west of Placedo in Sec. 11, SA&MG Sur. A-308. IPF 162 BOPD, 10/64-in. choke, TP 1,050 psi., CP 1,200 psi., 43.7°, GOR 708:1, 6,635-ft. Frio 6,633-37 ft. TD 7,276 ft. New oil discovery.

WEST CENTRAL TEXAS

Callahan County:
Prorated in Regular field. Angus Oil Co. et al. 1 Kennard Estate, 5 miles north of Clyde in Sec. 2, TCRR Sur. IPP 23 BOPD plus 10% water, 41°, Flippen sand 1,558-61 ft. TD 1,610 ft. New oil discovery.

Haskell County:
Champlin Oil & Refining Co. 1 Alfred Turnbow, 5 miles north of Haskell in J. Montgomery Sur. 2, A-5640. IPP 126 BOPD, 37.8°, GOR 270:1, Strawn 4,629-32 and 4,637-42 ft. TD 5,640 ft. New oil discovery.

WEST TEXAS

Martin County:
J. E. Jones Drilling Co. et al. 1 Wilkinson, 8 miles northeast of Stanton in Sec. 2, Blk. 34, T-1-N. IPP 232 BOPD plus 16% water, 39°, GOR 530:1. Spraberry 7,512-17 and 7,522-26 ft. TD 7,610 ft. New oil discovery.

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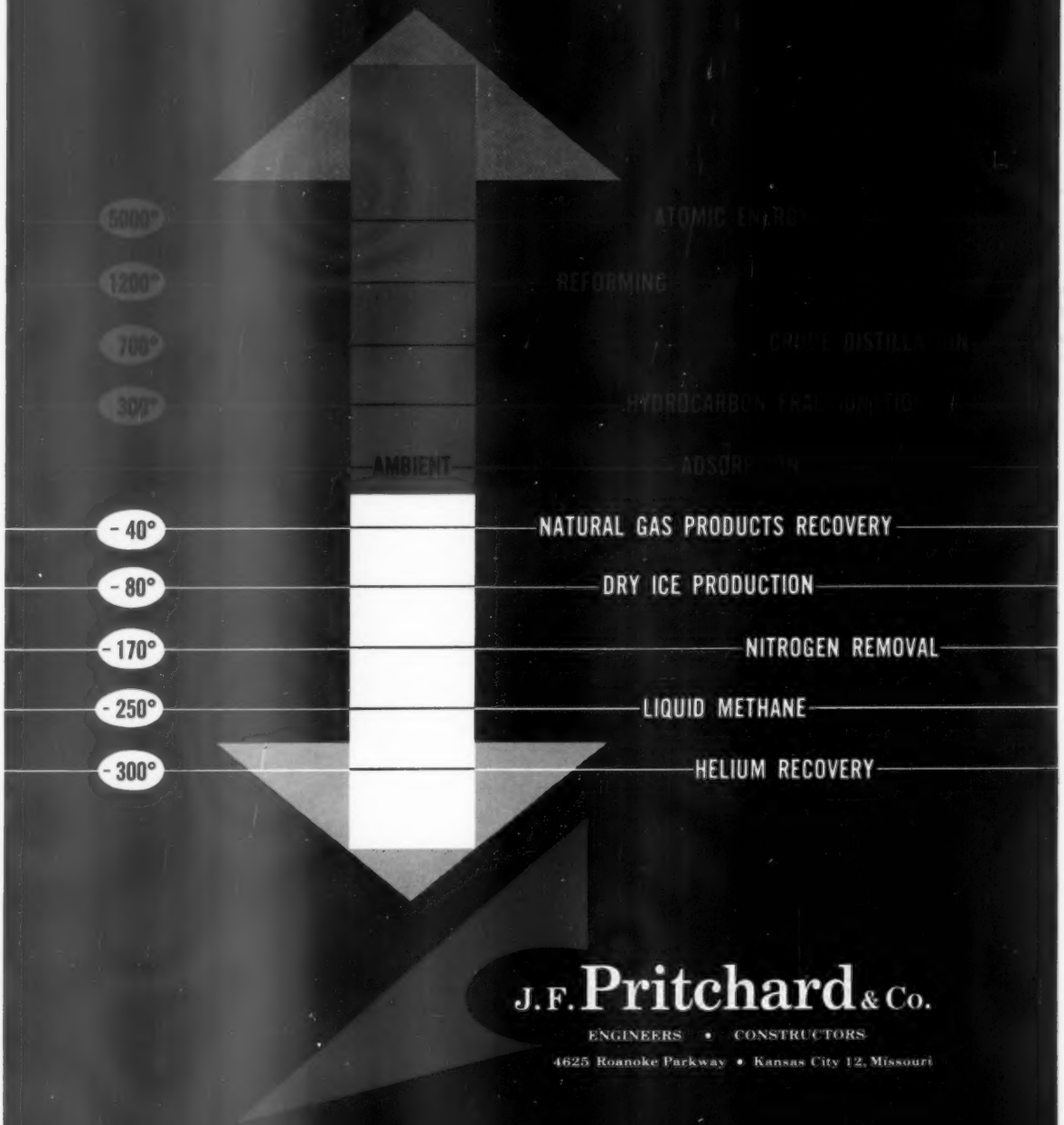

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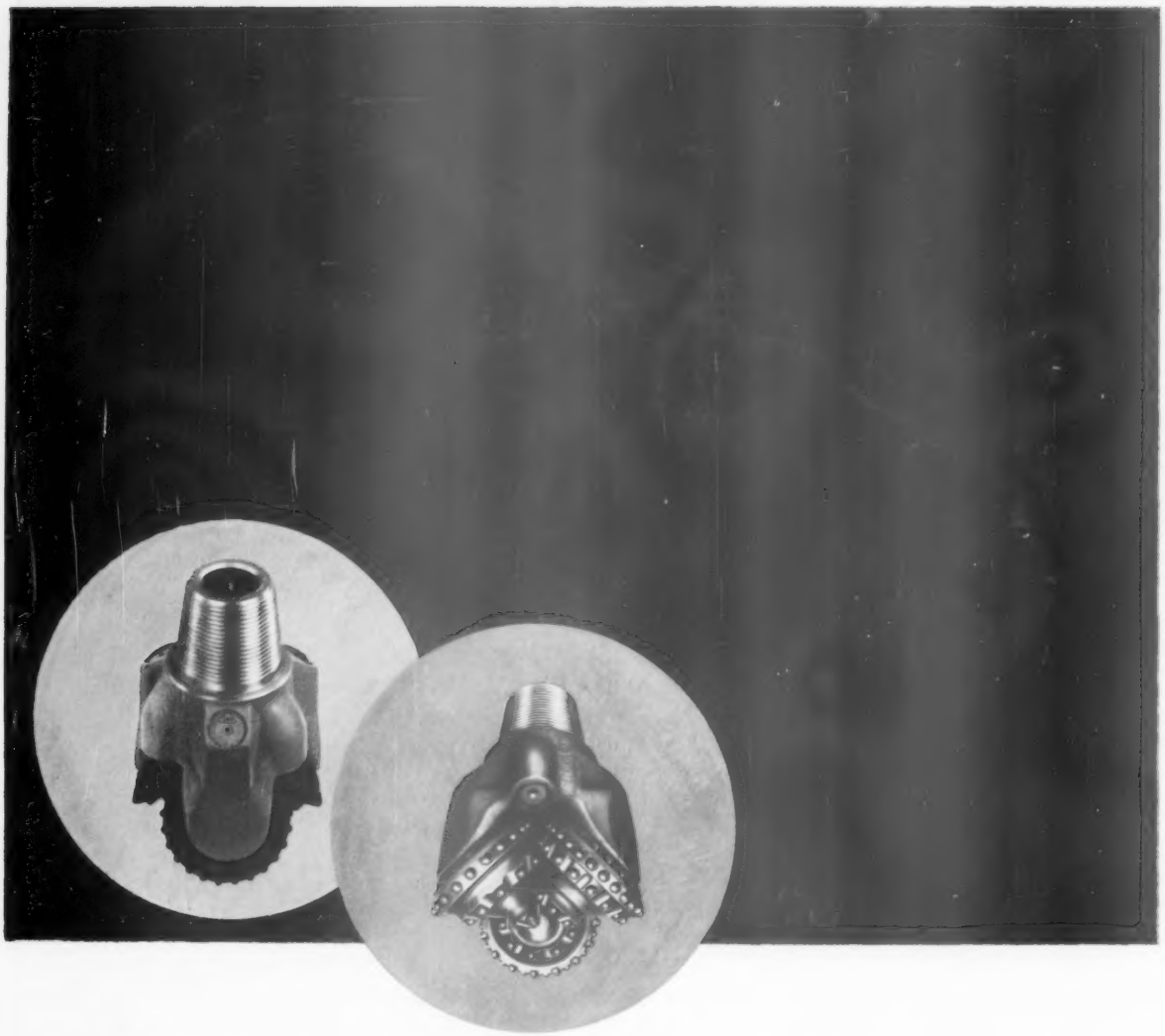

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